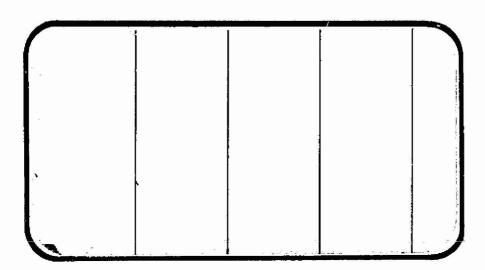


NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

(NASA-CE-151037) RESULTS OF INVESTIGATIONS CONLUCTED IN THE LARC 8-FOCT TRANSONIC PRESSURE TUNNEL USING THE 0.010-SCALE 72-015 MODEL OF THE SPACE SHUTTLE INTEGRATED VEHICLE (IA93) (Unrysler Corp.) 575 p

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SPACE SHUTTLE

AEROTHERMODYNAMIC DATA REPORT



JOHNSON SPACE CENTER

HOUSTON, TEXAS

SPACE DIVISION CHRYSLER CORPORATION

DMS-DR-2326 NASA CR-151,037

VOLUME 1 OF 2

RESULTS OF INVESTIGATIONS CONDUCTED IN THE

Larc 8-FOOT TRANSONIC PRESSURE TUNNEL

USING THE 0.010-SCALE 72-OTS MODEL OF THE

SPACE SHUTTLE INTEGRATED VEHICLE (IA93)

ъу

M. E. Nichols Shuttle Aerosciences Rockwell International Space Division

Prepared under NASA Contract Number NAS9-13247

bу

Data Management Services Chrysler Corporation Space Division New Orleans, La. 70189

for

Engi ring Analysis Division

National Aeronautics and Space Administration Houston, Texas

WIND TUNNEL TEST SPECIFICS:

LARC 8 TPT-749 Test Number:

NASA Series Number: IA93 Model Number: 72-0TS

May 10 through May 14, 1976 Test Dates:

Occupancy Hours:

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Chrysler Corporation Space Division assumes no responsibility for the data presented other than display characteristics.

RESULTS OF INVESTIGATIONS CONDUCTED IN THE

Larc 8-FOOT TRANSONIC PRESSURE TUNNEL

USING THE 0.010-SCALE 72-OTS MODEL OF THE

SPACE SHUTTLE INTEGRATED VEHICLE (IA93)

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ABSTRACT

This report documents the test procedures, history, and data from Wind Tunnel Test IA93, conducted in the NASA Langley Research Center's 8-foot Transonic Pressure Tunnel, May 10 through May 14, 1976.

Test IA93 was an aero-loads investigation on the updated configuration-5 space shuttle launch vehicle at Mach numbers from 0.600 to 1.205. Six-component vehicle forces and moments, base and sting-cavity pressures, elevon hinge moments, wing-root bending and torsion moments, and normal shear force data were obtained. Full simulation of updated vehicle protuberances and attach hardware was employed.

This test was one of a series of three (3) programs run consecutively: IA94A (UPWI leg #1), IA94B (UPWI leg #2), and IA93 (8' TPT).

Various elevon deflection angles were tested with two different forward orbiter-to-external-tank attach-strut configurations. The entire model 72-OTS was supported by means of a balance mounted in the orbiter through its base and suspended from a sting.

ABSTRACT (Concluded)

This report consists of 2 volumes:

Volume 1--plotted coefficient data;

Volume 2--tabulated data.

The tabulated IA93 data comprises:

- (a) Raw wind tunnel data (RJJOXX, SJJOXX, TJJOXX data sets),
- (b) Interpolated Mach, alpha, and beta data (FJJOXX, IJJOXX, MJJOXX data sets, corrected for base cavity and base pressure effects),
- (c) Data from item (b) elevon interpolated (MJJAXX, MJJBXX data sets).

The plotted coefficient data presented in this report represents the elevon interpolated data (item (c)).

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FIGURE		CONDITIONS	COEFFICIENTS	
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SCHEDULE OF COEFFICIENTS PLOTTED:

A)
$$C_{N_F}$$
, C_{A_F} , C_{m_F} , $C_{A_{B_O}}$, $C_{A_{B_S}}$, $C_{A_{B_T}}$ VERSUS α

B)
$$C_{\Upsilon}$$
, C_{n} (BODY), C_{ℓ} (BODY) VERSUS α

c)
$$c_{N_W}$$
, c_{B_W} , c_{T_W} versus α

D)
$$c_{H_{E_{\perp}}}$$
, $c_{H_{E_{O}}}$ VERSUS α

Ü

NOMENCLATURE

Plot <u>Symbol</u>	Mnemoni c	<u>Definition</u>
A		Total vehicle axial-force, lbs.
A_{BF}	ABF	Body flap planform area, ft?
A_{B_O}	AB0	Orbiter base area, ft?
$A_{\mathrm{B}_{\mathrm{S}}}$	ABS	SRB base area, ft?
$A_{\mathbf{B}_{\mathbf{\underline{I}'}}}$	ABT	ET base area, ft?
$^{A}C_{O}$	ACO	Orbiter sting-cavity area, ft?
ÀU		Uncorrected total vehicle axial-force, lbs.
$\mathtt{BM}_{oldsymbol{W}}$		Bending moment at YWRC, in-1b.
$\mathtt{BM}_{\mathtt{W}_{\mathtt{l}}}$		Bending moment at inboard wing-root bending gauge, in-lb.
$\mathtt{BM}_{\mathtt{W}_2}$		Bending moment at outboard wing-root tending gauge, in-lb.
Мą		Wing reference span, in.
c_A	CA	Total vehicle axial-force coefficient
c_{A_B}	CAB	Total vehicle base axial-force coefficient
$\mathbf{c_{A_{B_{0}}}}$	CABO	Orbiter base axial-force coefficient
$^{\mathrm{C}_{\!A_{B_{\mathrm{S}}}}}$	CABS	Solid rocket booster base axial-force coefficient
$\mathtt{c}_{\mathtt{A}_{B_T}}$	CABT	External tank base axial-force coefficient
$\mathtt{c}_{\underline{\mathfrak{t}}_{\overline{U}}}$	CTU	Uncorrected total vehicle lift coefficient

Plot Symbol	Mnemonic	<u>Definition</u>
$\mathtt{C}_{\mathbb{A}_{\overline{F}}}$	CAF	Total vehicle forebody axial-force coefficient
$c_{\mathrm{D}_{\mathrm{U}}}$	CDU	Uncorrected total vehicle drag coefficient
$c^{V\Omega}$	CAU	Uncorrected total vehicle axial-force coefficient
c_{B_W}	CBW	Wing-root bending-moment coefficient
$c_{H_{\underline{E}_{\underline{I}}}}$	CHEI	Inboard elevon hinge-moment coefficient
$\mathbf{c_{H_{E_O}}}$	CHEO	Outboard elevon hinge-moment coefficient
$\mathtt{c}_{\mathtt{H}_{\mathbf{E_{T}}}}$	CHET	Total elevon hinge-moment coefficient
C_{m}	CLM	Total vehicle pitching-moment coefficient
c_{m_B}	CLMB	Total vehicle base pitching-moment coefficient
$c_{m_{B_O}}$	CLMBO	Orbiter base pitching-moment coefficient
c^{mBL}	CLMBF	Orbiter body flap upper surface pitching-moment coefficient
$\mathbf{c}_{\mathbf{m}_{\mathbf{F}}}$	CLMF	Total vehicle forebody pitching-moment coefficient
$\mathtt{G}^{\mathrm{m}\Omega}$	CIMU	Uncorrected total vehicle pitching-moment coefficient
Cn(BODY)	CYN	Total vehicle yawing-moment coefficient, body axis
CN	CN	Total vehicle normal-force coefficient
$c_{N_{{\color{blue}B}}}$	CNB	Total vehicle base normal-force coefficient
$c_{N_{B_O}}$	CNBO	Orbiter base normal-force coefficient

Plot Symbol	Mnemonic	Definition
$c_{ m N_{BF}}$	CNBF	Orbiter body flap upper surface normal-force coefficient
$c_{N_{\overline{F}}}$	CNF	Total vehicle forebody normal-force coefficient
$\mathtt{c}^{\mathbb{N}^{\Pi}}$	CNU	Uncorrected total vehicle normal-force coefficient
$c_{N_{\overline{W}}}$	CNW	Normal-force coefficient for wing panel
$c_{P_{B_1}}$	CPBi	Base pressure coefficient at Station i (1 = 1 to 8)
r/d	L/DU	Uncorrected total vehicle lift to drag ratio
$c_{P_{BF}}$	CPBF	Rody flap surface-pressure coefficient
$c_{P_{\overline{B}_{\overline{O}}}}$	CPBO	Orbiter base-pressure coefficient
l _{ef}	LBF	Longitudinal body flap transfer distance, in.
$^{\mathrm{Cp}}_{\mathrm{B}_{\mathbf{S}}}$	CPBS	SRB base-pressure coefficient
$c_{P_{B_{T}}}$	CPBT	ET base-pressure coefficient
${\rm A_{B_{OMS}}}$	ABOMS	OMS pod base area, ft?
$^{\mathrm{CP}_{\mathrm{C}_{\mathbf{j}}}}$	CPCj	Sting-cavity pressure coefficient at Station j
$c_{P_{C_0}}$	CPCO	Orbiter sting-cavity pressure coefficient
$\mathbf{c}_{\mathbf{T}_{W}}$	CTW	Wing-root torsion-moment coefficient
$\mathbf{c}_{\mathbf{Y}}$	CY	Total vehicle side-force coefficient
C _{&} (BODY)	CBL	Total vehicle rolling-moment coefficient, body axis

Plot Symbol	Mnemonic	Definition
\underline{c}^M	LREF	Mean wing reference chord, in.
$ar{\mathbf{c}}_{\mathbf{E}}$	CE	Mean elevon reference chord, in.
D ₁		Lateral distance from electrical center of inboard wing-root flexion gauge to wing-root flexion reference buttplane, YwRC, in.
D ₂		Lateral distance from electrical center of outboard wing-root flexion gauge to wing-root flexion reference buttplane, YWRC, in.
er		External tank
G ₃		Longitudinal distance from electrical center of wing-root torsion gauge to wing-root torsion reference station, XWRC, in.
$h_{\hbox{$B_{\hbox{$Z}$}}}$	HBZ	Vertical transfer distance from orbiter base area centroid to MRP, in.
$\mathtt{HM}_{\mathbf{E}_{\mathbf{I}}}$	HMEI	Inboard elevon hinge moment, in-1b.
$^{ ext{HM}}_{ ext{E}_{ ext{O}}}$	HMEO	Outboard elevon hinge moment, in-lb.
ib	IB	Orbiter base average inclination angle, deg.
i _m		Incidence angle of orbiter fuselage reference plane with respect to the ET fuselage reference plane; varies with attach structure AT130, deg.
L		Total vehicle rolling-moment, in-1b.
ℓ_{B}	BREF	Body reference length, in.
$\mathfrak{k}_{\mathrm{BX}}$	LBX	Longitudinal transfer distance from orbiter base area centroid to MRP, in:
m		Total vehicle pitching-moment, in-lb.
m_{\cupU}		Uncorrected total vehicle pitching-moment, in-lb.
М	MACH	Tunnel freestream Mach number

Plot Symbol	Mnemonic	<u>Definition</u>
n		Total vehicle yawing-moment, in-1b.
Ŋ		Total vehicle normal-force, 1b.
иυ		Uncorrected total vehicle normal-force, 1b.
иМ		Normal force on wing panel, 1b.
$P_{\mathbf{B_i}}$		Base pressure, psia.
$P_{\mathbf{C}_{A}}$		Sting-cavity pressure, psia.
PŢ	PT	Tunnel freestream total pressure, psia.
P_{∞}	P	Tunnel freestreem static pressure, psia.
q	Q(PSF)	Tunnel freestream dynamic pressure, psfa.
Re/ft	RN/L	Tunnel freestream unit Reynolds number, per foot
se	SE	Elevon reference area, ft?
s _W	SREF	Wing reference area, ft?
SRB	SRB	Solid rocket booster
TMW		Torsion moment at XWRC, in-1b.
TMW3		Torsion moment at wing-root torsion gauge, in-1b.
TŢ	TT	Tunnel freestream total temperature, OR
\mathbf{T}_{∞}	T	Tunnel freestream static temperature, °R
x_{BRC}		Balance moment reference center station, in.
x_{MRC}	XMRP	Vehicle reference center station, in.
x_0	ох	Orbiter longitudinal station, in.
Xs	XS	SRB longitudinal station, in.

Plot Symbol	Mnemonic	<u>Definition</u>
ХŢ	XT	ET longitu/linal station, in.
XWRC		Wing-root torsion reference station, in.
Y		Total vehicle side-force, lb.
YBRC		Balance moment reference center buttplane, in.
YMRC	YMRP	Vehicle moment reference center buttplane, in.
YO	YO	Orbiter lateral coordinate, in.
Yg	YS	SRB lateral coordinate, in.
YŢ	YT	ET lateral coordinate, in.
YWRC		Wing-root bending reference buttplane, in.
z_{BRC}		Balance moment reference center waterplane, in.
z_{MRC}	ZMRP	Vehicle moment reference center waterplane, in.
z_0	ZO	Orbiter vertical coordinate, in.
z _s	zs	SRB vertical coordinate, in.
$\mathbf{z_{T}}$	ZT	ET vertical coordinate, in.
α	ALPHA	Model angle-of-attack, deg.
α_{U}		Uncorrected model angle-of-attack, deg.
β	BETA	Model angle-of-sideslip, deg.
β_{U}		Uncorrected model angle-of-sideslip, deg.
δ_{BF}	BDFLAP	Body flap setting, deg.
$\delta_{\mathbf{E_{I}_{L}}}$	ELV-LI	Left-hand inboard elevon setting, deg.
$\delta_{\mathrm{E_{I_{L_U}}}}$	ELVIC	Unloaded left-hand inboard elevon setting, deg.

NOMENCLATURE (Concluded)

Plot		
Symbol	Mnemonic	<u>Definition</u>
$\delta_{\mathrm{E}_{\mathrm{I}_{\mathrm{R}}}}$	ELV-RI	Right-hand inboard elevon setting, deg.
${}^{\delta_E}\!$		Unloaded right-hand inboard elevon setting, deg.
${}^{\delta}\mathbf{E}_{\mathbf{O}_{\mathbf{L}}}$	ELV-LO	Left-hand outboard elevon setting, deg.
${\mathfrak g}^{{\mathbb P} {\mathbb O}^{\textstyle \Gamma^{\textstyle \Omega}}}$	ELVOC	Unloaded left-hand outboard elevon setting, deg.
$\delta_{\mathrm{E}_{\mathrm{OR}}}$	ELV-RO	Right-hand outboard elevon setting, deg.
${}^{\delta_{{\rm E}_{\rm O}}}{}_{{\rm R}_{\rm U}}$		Unloaded right-hand outboard elevon setting, deg.
$\delta_{ m R}$	RUDDER	Rudder setting, deg.
$\delta_{ m SB}$	SPDBRK	Speedbrake setting, deg.

SUBSCRIPTS

В	base
BF	body flap
C	cavity
E	elevon
F	forebody
I	inboard
L	left
0	Orbiter, outboard
R	right
S, s	SRB
SB	speedbrake
T	external tank, total
U	uncorrected
W	wing
œ	static
	•

REMARKS

This test program (also tests IA94A and IA94B) proceeded without difficulty, and practically all data were acceptable for analysis and presentation.

Again, as in the UPWT tests (IA94A and B), all main-balance force and moment data were excellent, along with base and sting-cavity pressure coefficients. Elevon hinge moments were obtained without problem, also. Wing-root bending-moments, torsional-moments, and normal-shear forces were corrected for thermal-drift effects following the test and additional calibrations.

Most notable in this transonic testing, however, were the effects of shock-reflection patterns on elevon hinge-moment data. Data recorded for Mach numbers between 0.96 and 1.15 have been carefully edited by Langley Research Center test engineering personnel to eliminate questionable data in this Mach-regime. Further investigations on all transonic integrated-vehicle data from previous tests, e.g., IA135-A, B, C at ARC 11' UPWT, have been carried out to determine sting effects on such data as a result of this test's output.

CONFIGURATIONS INVESTIGATED

The 72-OTS model used in this test was a 0.010-scale replica of the updated vehicle-5 launch configuration of the space shuttle without main propulsion system nozzle simulation. The configuration-140C wing was employed in place of the standard -140A/B wing for instrumentation purposes. Figure 2a shows the launch vehicle configuration. Figure 2b shows the orbiter configuration.

Full protuberance simulation on the external oxygen/hydrogen tank and the two solid rocket boosters was included, based primarily upon the B revision of Interface Control Document 2-00001. Figures 2c and 2d show the ET and SRB configurations.

The forward orbiter/external tank attach-hardware was designated AT130. AT130 was a close simulation of the actual vehicle-5 fixtures.

Elevons were the only control surfaces deflected during the test. Rudder, speedbrake, and body flap were maintained at 0° settings. Control surface deflection sign convention is defined in Figure 1b.

The entire vehicle was suspended from a balance/wiing assembly fitted into the orbiter fuselage through its base region, at all test conditions and configurations.

The model was tested with and without base pressure instrumentation manifolds and tubing installed. Figure 2e shows the base pressure tap locations.

The 140A/B orbiter model is designated as "O" in Table II and in

CONFIGURATIONS INVESTIGATED (Continued)

the data. It was constructed with the following components:

Description
140A/B/C orbiter
Orbiter fuselage
Canopy
Elevons
Body flap
OMS pods
OMS nozzles
Rudder
Vertical tail
Wing

The modified vehicle-5 external tank model, designated as "T", was comprised of the following components:

Component	Description
^{AT} 28	Attach structure
AT ₃₀	Attach structure
AT31	Attach structure
AT ₁₃₁	Attach structure
FL ₁₀	LH ₂ feedline
FL	LO ₂ feedline
FR ₁₀	Fairing
PT ₂₃	${\rm LO}_2$ recirculation line

CONFIGURATIONS INVESTIGATED (Continued)

Component	Description
PT25	Aft electrical line
PT26	LO2 pressure line
PT29	Forward electrical conduit
PT33	LH2 pressure line
PT39	ET nose probe
^Т 35	Modified Vehicle-5 external tank fuselage

The modified vehicle-5 solid rocket booster model, designated "S", consisted of the following components:

Component	<u>Description</u>
${\tt FR_{14}}$	ET nose cable fairing
FR ₁₅	ET nose fairing for PT39
^{FR} 16	${ m LO_2}$ feedline (FL $_{ m l,l}$) fairing
FR ₁₇	${ m LO_2}$ antigeyser-line (PT $_{ m 23}$) fairing
FR ₁₈	Aft electrical-conduit (PT25) fairing
FR ₁₉	LH ₂ pressure-line (PT ₃₃) fairing
N ₁₀₆	SRB nozzles
PS ₂₀	Electrical tunnel
PS ₂₃	Forward separation motors
PS ₂₆	Aft attach ring, SRB
PS ₂₇	SRM nozzle actuator struts
^{PS} 28	Aft separation motor fairing
PS ₂₉	Tiedown struts

CONFIGURATIONS INVESTIGATED (Concluded)

Component	Description
PS ₃₀	APV exhaust outlets
PE 31	Command antennae
PS ₃₂	Data capsule and camera
PS ₃₃	3 intermediate structural rings
PS ₃₄	Aft cable housing
PS ₃₅	Aft structural ring
^{PS} 36	Aft separation motors
5 ₂₄	Modified vehicle-5 solid rocket booster fuselage

AT₁₃₀ Forward O/T attach structure.

Also tested was:

Detailed model dimensional data are given in Table III. Figure 2 presents sketches of the model. Figure 3 presents a photograph of the model.

INSTRUMENTATION

The 72-OTS model employed during this test program was outfitted for measurement of left-hand inboard and outboard elevon hinge moments, right-hand wing-root bending and torsion moments and shear force, total-vehicle six-component forces and moments, and base and sting-cavity pressures.

Standard strain-gauge beam instrumentation was used for the elevon and wing-panel data. The LRC #840 1.435-inch balance, installed in the orbiter, was employed for total-vehicle forces and moments. Separate differential pressure transducers were used to measure the eight (8) base and sting-cavity pressures, distributed on the Orbiter, Embernal Tank, and left-hand Solid Rocket Booster.

Figure 2e shows the base pressure tap locations.

TEST FACILITY DESCRIPTION

NASA/Langley Research Center 8-Foot Transonic Pressure Tunnel is an air-medium facility capable of attaining continuously variable Mach numbers from 0.20 to 1.30. It is a single-return, closed-circuit tunnel having controlled stagnation temperature, total pressure, and dew-point temperature. The test section is 7.1 feet square. Reynolds numbers are variable from $0.30 \times 10^6/\text{foot}$ to $7.00 \times 10^6/\text{foot}$, depending on Mach number and tunnel total-pressure limitations. Models are supported in the test section by a sting-sector system, but wall-mounting is possible. Schlieren photography is available for flow and shock-wave studies.

DATA REDUCTION

Model force and pressure data were reduced to coefficient form in both the body axis and stability-axis systems. Standard NASA/LaRC wind tunnel methods were used as required to maintain compatibility with the Chrysler Corporation/DATAMAN format. A final data-tape was submitted to DATAMAN after test completion.

Body-axis data were corrected for base, cavity, and surface-pressure effects, as follows:

1)
$$C_{AF} = C_{AU} - C_{ARO} - C_{ABT} - 2C_{ABS}$$
where $C_{ABO} = -C_{PBO} \left(\frac{A_{BO}}{SW}\right) - C_{PCO} \left(\frac{A_{CO}}{SW}\right)$
 $C_{ABT} = -C_{PBT} \left(\frac{A_{BT}}{SW}\right)$
 $C_{ABS} = -C_{PBS} \left(\frac{A_{BS}}{SW}\right)$

2)
$$c_{N_F} = c_N - c_{N_{BO}} - c_{N_{BF}}$$
where
$$c_{P_{B2}} = c_{P_{BF}}$$

$$c_{N_{BF}} = -c_{P_{B2}} \left(\frac{A_{BF}}{S_W} \right)$$

$$c_{N_{BO}} = -c_{P_{BO}} \left(\frac{A_{BO} - A_{BOMS}}{S_W} \right) \text{ tan } i_B - c_{P_{CO}} \left(\frac{A_{CO}}{S_W} \right) \text{ tan } i_B$$

3)
$$c_{mF} = c_{m} + c_{mBO} + c_{mBF}$$
 where
$$c_{mBO} = c_{NBO} \left(\frac{\ell_{BX}}{\ell_{B}} \right) - c_{ABO} \left(\frac{h_{BZ}}{\ell_{B}} \right)$$

$$c_{mBF} = c_{NBF} \left(\frac{\ell_{BF}}{\ell_{B}} \right)$$

DATA REDUCTION (Continued)

Inboard and outboard elevon panel hinge-moment coefficients were computed as follows:

$$c_{H_{E_{I}}} = \frac{HM_{E_{I}}}{q_{S_{E}}}$$

$$c_{H_{E_O}} = \frac{H^{A_{E_O}}}{q_{S_E} c_E}$$

Right-wing exposed-panel bending and torsional moments, bending and torsional moment coefficients, and normal force were computed as follows:

$$N_{W} = \left(\frac{BM_{W_1} - BM_{W_2}}{\left(D_1 - D_2\right)}\right)$$

$$TM_W = TM_{W_3} + N_WG_3$$

$$BW^{M} = BW^{M}^{J} + BW^{M}^{S} - W^{M}(D^{J} + D^{S})$$

$$C_{N_W} = \frac{N_W}{qS_W}$$

$$C_{\text{B}_W} = \frac{\text{RM}_W}{\text{qs}_W \text{-} \text{b}_W}$$

$$c_{T_W} = \frac{TM_W}{qs_W c_W}$$

Left-hand inhoard and outboard elevon deflection angles were corrected for elevon-deflection-due-to-load as follows:

$$\delta_{E_{1}\Gamma} = \delta_{E_{1}\Gamma} + H_{W_{E_{1}}} \left(\delta_{E_{1}\Gamma} / H_{W_{E_{1}}} \right)$$

DATA REDUCTION (Continued)

where:

$$\binom{\delta_{E_{T_L}}/HM_{E_T}}{hinge-moment}$$
 = deg/in-lb calibration of the inboard elevon

$$\left(\delta_{E_{O_L}/HM_{E_O}} \right) = \frac{\deg/\text{in-lb calibration of the outboard elevon hinge-moment beam}$$

Elevon deflection angles, measured with no hinge-moment acting on them, differed from nominal values as follows:

		ACTUAL MEASURI	ED $\delta_{ m E}$, DEG.	
NOMINAL 6E, deg.	LEFT OUTBOARD SURFACE	LEFT INBOARD SURFACE	RIGHT INBOARD SURFACE	RIGHT OUTBOARD SURFACE
-10	-9-537		- -	-9.604
- 5	-4.720			-4.027
0	0.000	0,000	0.000	0.000
2	3.647		₩.	1982
14	5.039			3.969
8	And gard	7.665	7.385	
9	10.436			9.905
10		10.203	9.110	
12	err u er	12.081	10.999	
14	15.778			14.467

Positions in the above array where values are not given represent deflection angles not used in this test.

DATA REDUCTION (Continued)

The following reference dimensions and constants were used for data reduction (lengths are given in inches, areas in square feet, and angles in degrees):

Symbol	Model Scale	Full Scale
ABF	0.0143	142.60
A_{B_O}	0.0270	269.70
ABOMS	0.0123	122.60
A_{BS}	0.0236	236.46
ABŢ	0.0605	604.80
ACO	0.0167	167.00
уď	9.367	936.680
σ_{E}	0.907	90.700
σ ₩	4.748	474.800
Dl	3272	
D ₂	8185	
G ₃	+1.1700	
$\mathtt{h}_{B_{\mathrm{Z}}}$	3.365	336.500
iB	14.750	14.750
$^{ ext{i}_{ ext{MA}}}$ 130	.133	.133
$\mathfrak{L}_{\mathrm{B}}$	12.903	1290.300
$\mathfrak{L}_{\mathrm{BF}}$	13.297	1329.70
$\mathfrak{L}_{B_{X}}$	12.630	1263.00
$s_{\mathtt{E}}$	0.0210	210.00

DATA REDUCTION (Continued)

Symbol .	Model Scale	Full Scale
$\mathbf{s}_{\mathtt{W}}$	0.2690	2690.00
x_{BRC}	18.177	1817.700
x_{MRC}	9.760	976.000
x_{WRC}	20.480	2048.000
$\mathbf{Y}_{\mathbf{BRC}}$	0.000	0.000
$\mathbf{Y}_{\mathbf{MRC}}$	0.000	0.000
YWRC	1.050	105.000
z_{BRC}	7.265	726.500
ZMRC	14.000	400.000
$\left(\delta_{E_{IL}}/\text{HM}_{E_{I}}\right)$	0.47513°/in-1b(0.20625°/in-1b(
$\left(\delta_{\mathrm{EOL}}/\mathrm{HM_{EO}}\right)$	0.36667°/in-lb(0.18333°/in-lb(

The wind tunnel coefficient data presented in this report have been corrected for base cavity and base pressure effects. These data have also been interpolated versus Mach number, angle-of-attack, and angle-of-side-slip. Data sets 1 and 60 could not be interpolated versus these variables and therefore these interpolated data sets are not presented in this report.

The following coefficients were requested for additional interpolation versus elevon deflection angles (ELV-LI, ELV-LO), to the nominal values (see Table II):

DATA REDUCTION (Concluded)

INPUT <u>DATA SETS</u>			COI	EFFICIE	<u>nts</u>		
FJJOXX	CNW	CBW	CTW				
IJJOXX	CABO	CVBL	CABS	CAF	CNF	CLMF	
MJJOXX	CYN	CBL	CY	CHET	CHEO	ELV-LI	ELV-LO

These coefficients data were combined to form the following data sets:

DATA SETS						ICIENT				
MJJAXX	CNW	CBW	CTW	CYN	CBL	CY	CHEI	ELV-LI	CHEO	ELV-LO
MJJBXX	CAF	CNF	CLMF	CABO	CABT	CABS	CHET	ELV-LI	CHEO	ELV-LO

Data sets 63-71 and data at Mach 0.6 could not be elevon interpolated due to limited data. Also, due to data limitations, data sets 12-16 (Mach numbers 1.15 and 1.205), could not be elevon interpolated.

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

6/7/76 DATE : TEST : 1493 **TEST CONDITIONS** REYNOLDS NUMBER DYNAMIC PRESSURE STAGNATION TEMPERATURE MACH NUMBER (per unit length) (pounds/sq. inch) (dagrees Fahrenheit) 3.16 x 10⁶/FT 0.600 2.90 120 4.48 4.12 11.03 0.900 3.97 0.960 4.04 5.24 2.66 0.975 2.04 4.09 5.32 4.81 6.28 0.980 4.11 5.34 4.13 0.990 5.39 4.19 5.65 1.050 1.120 4,23 5.89 4,26 1.150 5.98 1.205 4.31 6.12 TRC //810 BALANCE UTILIZED: _ COEFFICIENT CAPACITY: ACCURACY: **TOLERANCE:** 800 1ъ NF 250 1ъ SF 125 lb AF 1600 in-lb РМ 500 in-lb RM 500 in-lb YΜ COMMENTS:

TABLE I.

		93(LaR	C 8 TPT 749)] 									N SUMA				: 9/				
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TABLE II. (Continued)

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TABLE II. (Continued)

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TABLE II. (Continued)

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TABLE II. (Concluded)

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TABLE III. MODEL DIMENSIONAL DATA

MODEL COMPONENT: ATTACH STRUCTURE - AT28

GENERAL DESCRIPTION: Rear orbiter to ET attach structure (left-hand and

right-hand) (two members)

MODEL SCALE: 0.010

DRAWING NUMBER: VL78-000063, VL78-000062B

DIMENSIONS:	in.			FULL SCALE	MODEL SCALE
	Member	r #1	χ _ο Υ _ο	1317.00 - 96.50 (LH) 96.50 (RH) 267.50	13.170 - 0.965 0.965 2.675
			Z _O X _T YŢ	2058.0 - 96.50 (LH) 96.50 (RH)	20.590 - 0.965
			$z_{ m T}$	515.50	5.155
	Membei	c #2	X _o Y _o Z _o X _T Y _T	1317.0 - 96.50 (LH) 96.50 (RH) 267.50 1872.0 - 125.68 (LH) 125.68 (RH	0,965 2,675 18,720
Diamete	r, In.	#1 #2		11.5 15.5	0.115 0.155

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT:

ATTACH OFRUCTURE - AT 30

GENERAL DESCRIPTION: Forward SRB to ET attach structure (left-hand and

right-hand)

MODEL SCALE: 0.010

DRAWING NUMBER: VL78-000066, Martin-Marietta 82600204300, VC78-000002

DIMENSIONS:			FULL SCALE	MODE	L SCALE
Attach poi	nt, in.	x _{'T}	985.675		9.856
		YŢ	- 172.50 (LH) + 172.50 (RH)	+	1.725 1.725
		z_{T}	0,0		0.0
		x _s	442.675		4.427
		YS	80.0		0.800
		$z_{\rm g}$	0.0		0.0
		x _o	244.675		2.447
		Y _O	- 184.5 + 184.5		1.845 1.845
		Z _O	0.0		0.0

MODEL COMPONENT: ATTACH STRUCTURE - AT31

GENERAL DESCRIPTION: Rear ET to SRB attach structure (LH and RH), 3

members

MODEL SCALE: 0.010

DRAWING NUMBER: VL78-000063, VL78-000062B, VL78-000066, VC78-000002

DIMENSIONS:	in.				FULL SCALE	MODEL SCALE
		Member #	<i>(</i> 1)	X _T Y _T Z _T X _S Y _S Z _S	2058.00 - 171.50 (MH) 171.50 (RH) 457.00 1511.0 53.24 57.0	20.580 - 1.715 1.715 4.570 15.110 0.532 0.570
		Member #	łe	Xդ Xդ Zդ	2058.0 - 163.85 449.81	20.580 1.639 4.498
				X YS ZS	1511.0 76.56 15.73	15.110 0.766 0.157
		Member #	¹ 3	Xդ Xդ Zդ	2058.00 - 161.72 343.0	20.580 - 1.617 3.430
				X _S Y _S Z _S	1511.0 53.24 - 57.00	15.110 0.532 - 0.570

MODEL COMPONENT: ATTACH STRUCTURE - AT₁₃₀

GENERAL DESCRIPTION: Forward orbiter/ET attach structure (2 members

structure).

MODEL SCALE: 0.010

DRAWING NUMBER: SS-A01.692

DIMENSIONS:		FULL SCAL	<u>e</u>	MODEL SCALE
Orbiter attach point:	x _o Y _o z _o	388.9 0 0 283.8	(RH)	3.889 0 0 2.838
	XT YT ZT	1129.9 0 0 620.3	(LH) (RH)	11.299 0 0 6.203
Tank attach point:	X _T Y _T Z _T	388.9 42.75 42.75 227.5	(LH) (RH)	
	x _o Y _o z _o	1129.9 42.75 42.75 564.0	(LH) (RH)	11.299 .4275 .4275 5.640

Component

Definition

AT131

Rear Orbiter/External Tank attach structure per ICD-2-00001, Rev. B, model dwg. SS-A01668-3. This attach structure is a connecting link between R. H. AT₂₈ and External Tank.

Located at:

Model Scale-In. Full Scale-In. $X_{\text{T}} = 20.580$ $X_{\text{T}} = 2058.00$

BODY - B26 MODEL COMPONENT:

GENERAL DESCRIPTION: Configuration 1/10A/B orbiter fuselage

NOTE: B_{26} is identical to B_{24} except underside of fuselage has been refaired to accept W116.

MODEL SCALE: 0.010 MODEL DRAWING: SS-AOOL47, Release 12

DRAWING NUMBER: VL70-000143B, -000200, -000205, -006089. -000145 VL70-000140A, -000140B

DIMENSIONS:	FULL SCALE	MODEL SCALE
Length (OML: Fwd Sta. $X_0 = 235$), In. Length (IML: Fwd Sta. $X_0 = 238$), In.	1293.3 1290.3	12.933 12.903
Max Width (@ $X_0 = 1528.3$), In.	264.0	2.640
Max Depth (@ $X_O = 1464$), In.	250.0	2.500
Fineness Ratio	0.264	0.261
Area - Ft ²		
Max. Cross-Sectional	340.88	0.031+

MODEL COMPONENT: CANOPY - 09

GENERAL DESCRIPTION: Configuration 3A. Canopy used with fuselage B26.

MODEL SCALE: 0.0100 MODEL DRAWING: SS-A00147, Release 12

DRAWING NUMBER: VE/O-00011/34

DIMENSIONS:	FULL SCALE	MODEL SCALE
Length $(x_0 = h3h.6h3 \text{ to } 578)$, In.	143.357	1.434
Max Width (@ $X_0 = 513.127$), In.	150.410	1.524
Max Depth (@ $X_0 = 485.0$), In.	25.000	0.250

MODEL COMPONENT:

EIEVON, E52

GENERAL DESCRIPTION: Elevon for Configuration 140C. Hingeline at $X_o = 1387$, elevon split line $X_o = 312.5$, 6.0" gaps, beyond edges, and centerbodies.

MODEL SCALE:

0.010

DRAWING NUMBER: VL70-000140C, -006089, -006092, SS-A0137

DIMENSIONS: (Data for one side)	FULL SCALE	MODEL SCALE
Area - Ft ²	21.0.0	0.021.0
Span (equivalent) - In.	349.8	3.492
Inb'd equivalent chord - In.	118.0	1.180
Outb'd equivalent chord - In.	55.19	0.552
Ratio movable surface chord/ total surface chord		
At inb'd equiv. chord	0.2096	0.2096
At outb'd equiv. chord	0.110011	0.4004
Sweep Back Angles, dogroes		
Leading Edge	0.0	0.0
Trailing Edge	-10.056	-10.056
Hingeline	0.00	0.00
Area Moment (Normal to hinge line)-ft3	1587.25	.001587
Mean Aerodynamic Chord, In.	90.7	0.907
Hingeline dihedral (origin at $z_0 = 261.3509$), deg.	5.228986	5.228986

MODEL COMPONENT: BODY FLAP - Flo

GENERAL, DESCRIPTION: Configuration 1400 body flap. Hingeline located

at $X_0 = 1532$, $E_0 = 287$.

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-0001400, VL70-355114

DIMENSIONS:	FULL SCALE	MODEL SCALE
Length $(X_0 = 1525.5 - X_0 = 1613)$, In.	87.50	0.875
Max Width (@ L.E., $X_0 = 1525.5$), In.	256.00	2.560
Max Depth ($X_0 = 1.532$), In.	19.798	0.198
Fineness Ratio		
Area - Ft ²		
Max. Cross-Sectional (@ H.L.)	35.196	0.0035
Planform	135.00	0.014
Wetted		
Base $(X_0 = 1613)$, In. ²	4.89	0.0005

MODEL COMPONENT: FEEDLINE - FL

GENERAL DESCRIPTION: LH2 feedline on upper left-hand side of T35.

MODEL SCALE: 0.010

DRAHING NUMBER: VL78-000063, VL78-000062B

DIMENSIONS: in.		FULL SCALE	MODEL SCALE
Leading edge at:	$\mathbf{x}_{\mathbf{T}}$	2071.5	20.715
	$\mathbf{Y}_{\mathbf{T}}$	- 70.0	- 0.700
	$z_{ m T}$	5 73 •93 ¹ 4	5.739
Tailing edge at:	$\mathbf{x}_{\mathbf{T}}$	2081.8	80.818
	$\mathtt{Y}_{\mathbf{T}}$	- 70.0	- 0.700
	$z_{ m T}$	584.059	5.8h1
Line diameter (17.0 L.D.)		18.160	0.182

MODEL COMPONENT: FEEDLINE - FL

GENERAL DESCRIPTION: LO_2 feedline on upper right-hand side of T_{35} .

MODEL SCALE: 0.010

DRAWING NUMBER: VI78-000063, VI78-000062B

DIMENSIONS: in.		FULL SCALE	MODEL SCALE
Leading edge at:	$\mathbf{x}^{\mathbf{T}}$	1000.667	10.007
	Ym	70.00	0.700
	7 _T	564-340	5.643
Trailing edge at:	$\mathbf{x}_{\mathbf{T}}$	2071.5	20.715
	$\mathbf{Y}_{\mathbf{T}}$	70.00	0.700
	$z_{_{\overline{\mathbf{T}}}}$	573-934	5.739
Line diameter (17.0 I.D.)	-	18.16	0.182

Centerline of line located radially at $\emptyset = 203^{0}4^{\circ}$,

MODEL COMPONENT: FAIRING -FR10

GINERAL DESCRIPTION: Umbilical door fairing between aft ET/orbiter

attach structure,

MODEL SCALE: 0.010

DRAWING NUMBER: VI78-000063, VI78-000062B, Martin-Marietta 82600207000

DIMENSIONS:		FULL SCALE	MODEL SCALE
Leading edge at	$\mathbf{x}^{\mathbf{T}}$	2052.0	20.520
Length, In.		193.0	1.930
Width, In.		15.00	0.150

Component	Definition	
FR_{1}	External Tank nose cable model dwg. SS-A01668-5 1	
	Model Scale	Full Scale
	$X_{T} = 3.490 - 3.710, In.$	$X_{\rm T} = 3^{\rm h}9.00 - 371.00, In.$
	φ = 31°31'	$\phi = 31^{\circ}31'$
FR ₁₅	External Tank nose probe dwg. SS-AOL668-5 located	
	Model Scale	Full Scale
	$X_{T} = 3.413-3.710, In.$	$X_{T} = 311.30-371.00, In.$
FR ₁₆	External Tank LO ₂ feedling per model dwg. SS-A01668-	
	Model Scale	Full Scale
	X _T = 9.820-10.420,In.	$X_{\rm T} = 982.00-1042.00, In.$

Component	<u>Definition</u>	
FR _{1.7}	External Tank I.O. antig fairing per model dwg. Located at:	eyser line (PT ₂₃) SS-AO1668-3.
	Model Scale	Full Scale
	$X_{\rm T} = 9.860 - 10.460, In.$	$X_{\rm T} = 986.00 - 1046.00, In.$
	$\phi = 33^{0145}$	Ø = 33°115'
FR ₁₈	External Tank aft elect fairing per model dwg. Located at:	rical conduit (PT ₂₅) SS-AO1668-3.
	Model Scale	Full Scale
	$X_{\rm T} = 10.670 - 10.820, In.$	$X_{T} = 1067.00 - 1082.00, In.$
	Ø = 37°30°	ø = 37°30'
FR ₁₉	External Tank LH2 press fairing per model dwg. Located at:	ure line (PT33) SS-A01668-9:
	Model Scale	Full Scale
	$X_{\rm T} = 10.600 - 11.269, In.$	$X_{\rm T} = 1060.00 - 1126.90, In.$
	Ø = 30°0'	ø = 30°0'

MODEL COMPONENT: OMS POD - M16

GENERAL DESCRIPTION: Configuration 140C orbiter OMS pod - short pod.

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-008401, VL70-008410

DIMENSIONS:	FULL SCALE	MODEL SCALE
Length (OMS Fwd Sta. $X_0 = 1310.5$), In.	258.50	2.585
Max Width (@ $X_O = 1511$), In.	1.36.8	1 368
Max Depth (@ $X_0 = 1511$), In.	74.70	0.747
Fineness Ratio	2.484	e.484
Area - Ft ²		
Max. Cross-Sectional	58.864	0.0059

Component	Definition	
N89	Orbiter OMS nozzles loce M ₁₆ per model dwg. SS-AC	
N ₁₀₆	Solid Rocket Booster nor Solu per model dwg. SS-AC	
	Model Scale	Full Scale
	$X_s = 18.371 \rightarrow 19.306, In$	x _s = 1837.10→1930.60,In.
	Dia. = 1.479, In.	Dia. = 147.85, In.
PS ₂₀	Solid Rocket Booster eld per model dwg. SS-AO1667	
	Model Scale	Full Scale
	$X_{s} = h.424 \rightarrow 18.577, In.$	$x_{e} = hh2.h0 - 1857.70, In.$
	$\phi = 90_0 \text{ TH}$	Ø = 90° RH
	180° LH	180° LH
PS ₂₃	Solid Rocket Booster for motors per model dwg.	
	Model Scale	Full Scale
	$X_s = 2.854$ and 2.973. In.	$X_g = 285.40$ and 297.30, In.
	Ø = 20°RH	Ø = 20°RH
	340°LH	3)100TH

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT : SRB Protuberance - PS27			
GENERAL DESCRIPTION : SRM nozzle act	uator struts (2)		
	·		
MODEL SCALE: 0.010			
DRAWING NUMBER: ICD-2-00001, Rev. B:	SS-A01667, Rev.	C	
DIMENSIONS: inches	FULL SCALE	MODEL SCALE	
Length	21.25	0.213	
Width	3.0	0.030	
Height/Depth	4.890	0.049	
L. E. Location	1839.137	18.391	
T. E. Location	1860.387	18.604	
φ, Degrees	45 135	45 <u>135</u>	

Component	<u>Definition</u>	
PS ₂₆	Solid Rocket Booster af model dwg. SS-A01667-4	
	Model Scale	Full Scale
	$X_{S} = 15.110$, In.	X _s = 1511.00, In.
PS ₂₈	Solid Rocket Booster se motor fairings per mode Located on SRB skirt af ring at $\phi = 0 \rightarrow 36^{\circ}$ RH 324° $\rightarrow 360^{\circ}$	l dwg. SS-AO1667-38. t of rear structural
PS ₂₉	Solid Rocket Booster ti on SRB skirt per model located at:	
	Model Scale	Full Scale
	$X_s = 18.603 \rightarrow 19.306, In.$ $\emptyset = 30^{\circ}, 150^{\circ}, 210^{\circ}, 330^{\circ}$	$X_g = 1860.30 \rightarrow 1930.60$, In. $\emptyset = 30^{\circ}, 150^{\circ}, 210^{\circ}, 330^{\circ}$
PS ₃₀	Solid Rocket Booster au exhaust outlets per mod located at:	
	Model Scale	Full Scale
	$X_s = 19.306$, In. $\emptyset = 30^{\circ}30'$ RH $= 329^{\circ}30'$ LH	$X_s = 1930.60$, In. $\phi' = 30^{\circ}30'$ RH $=329^{\circ}30'$ LH

Component	<u>Definition</u>	
PS31	Solid Rocket Booster co model dwg. SS-A01667-28	mmend antenna per , located at:
	Model Scale	Full Scale
	$X_3 = h.026 \rightarrow h.526$, In.	$x_s = 402.60 \Rightarrow 452.60$, In.
	$\emptyset = 0^{\circ}$ & 180°	Ø = 0° & 180°
PS ₃₂	Solid Rocket Booster da camera per model dwg. S at:	
	Model Scale	Full Scale
	$X_{ij} = 4.017 + 4.402, In.$	X _S = 401.70→ 440.20, In.
	Ø = 90° RH	$\phi = 90^{\circ}$ RH
	=270° LH	= 270° LH
PS33	Solid Rocket Booster 3 tural rings per model d located at:	
	Model Scale	Full Scale
	X _{\$} = 16.559, In.	x _s = 1655.90, In.
	= 17.319	= 1731.90
	Model Scale X ₅ = 16.559, In.	Full Scale X _S = 1655.90, In.

= 17.760

= 1776,00

Component	<u>Definition</u>		
PS _{3l4}	Solid Rocket Booster aft cable housing per model dwg. SS-A01667-12, located at:		
	Model Scale	Full Scale	
	$X_{\rm g} = 4.726 - 18.554, In.$	$X_{S} = 472.60 - 1855.40$, In.	
	Ø = 90° RH	$\phi = 90^{\circ} \text{ RH}$	
	= 180° LH	= 180° LH	
PS ₃₅	Solid Rocket Booster at per model dwg. SS-A0166		
	Model Scale	Full Scale	
	$X_{S} = 18.371$, In.	$X_y = 1837.10$, In.	
^{PS} 36	Solid Rocket Booster af located on aft SRB skir SS-A01667-38. Located structural ring at $\phi = \frac{1}{2}$	ts per model dwg. aft of SRB rear	

TABLE TII. MODEL DIMENSTONAL DATA (Continued)

TOP RECIRCULATION LINE - PTP3 MODEL COMPONENT:

GENERAL DESCRIPTION: LO $_{\mathcal{O}}$ recirculation line on right-hand upper side of т₃₅.

MODEL SCALE: 0.010

DRAWING NUMBER: VL78-000063, VL78-000062B, Martin-Marietta 82600207000

DIMENSIONS:	in.		FULL SCALE	MODEL SCALE
Leading	edge at:	$\mathbf{x}_{\mathbf{T}}$	1040.667	10.407
		$\mathtt{Y}_{\mathbf{T}}$	94.169	0.942
		$z_{ m T}$	540.934	5.409
Trailing	g edge at:	$\mathbf{x}^{\mathbf{L}}$	2062.920	20.629
		$\mathbf{r}_{\mathbf{r}}$	70.0	0.700
		$Z_{\mathbf{T}}$	573 - 93 ^l i	5.739
Line dia	ameter, In.		11.0	0.040

Centerline of line located radially at $\phi = 213^{\circ}145^{\circ}$.

MODEL COMPONENT: ELECTRICAL LINE - PT 25

GENERAL DESCRIPTION: Right-hand aft electrical conduit line on T35 with

 LH_2 pressure sensor line and LO_2 vent valve actuator line.

MODEL SCALE: 0.010

DRAWING NUMBER: VI/78-000063, VI/78-000062B, Martin-Marietta 82600207000

DIMENSIONS: in.		FULL SCAIE	MODEL SCALE
Leading edge at:	x^{d}	1.084.333	10.843
	Y.T.	99.591	0.996
	$Z_{\mathbf{T}}$	539.620	5.396
Trailing edge at:	$\mathbf{x}^{\mathbf{L}}$	2058.00	20.580
	$\mathtt{Y}_{\mathbf{T}}$	99.591	0.996
	$r_{ m T}$	539.620	5. 396
Line diameter		2.0 x 6.0	0.02x0.06

Centerline of line located radially at $\phi = 215.5^{\circ}$,

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: LO2 PRESSURE LINE - PT26

GENERAL DESCRIPTION: LO2 pressure line on the T35

MODEL SCALE: 0.010

DRAWING NUMBER VL78-000063, VL78-000062B, Martin-Marietta 82600207000

DIMENSIONS: in.		FULL SCALE	MODEL SCALE
Leading edge at:	$x_{\mathtt{T}}$	360.733	3,607
	Y _T	15.145	. 1.515
	$z_{_{\mathrm{T}}}$	407.718	4.077
Trailing edge at:	x _T ,	2083.5	20.835
	$\mathtt{Y}_{\mathbf{T}}$	63.25	0.633
	$Z_{f T}$	609.0	6.090
Line diameter		5.0	0.020

Centerline of line located radially at ϕ = 207°,

Definition

Component

PT	External Tank fwd. elec dwg. 85-A01667-6. Loca	trical conduit per model ted at:
	Model Scale	Full Scale
	$X_{\rm T} = 3.607 \rightarrow 8.600$, In.	Xm = 360.73→860.00, In.
	\emptyset = Adjacent to PT ₂₆	ϕ = Adjacent to PT ₂₆
PT 33	External Tank LH2 press dwg. SS-A01668-9. Loca	ure line per model ted at:
	Model Scale	Full Scale
	$X_{\text{T}} = 10.600 \Rightarrow 20.580, In.$	$X_{\rm T} = 1060.00 \rightarrow 2058.00, In.$
	Ø = 330°01	Ø = 330°01

PT39 External Tank nose probe per model dwg. SS-A01668-5. Located at:

Model Scale

 $X_T = 3.225 \rightarrow 3.413$, In. $X_T = 322.5 \rightarrow 341.3$, In. Max. Dia. = 6.90 in.

Full Scale

MODEL COMPONENT: RUDDER - R₅

GENERAL DESCRIPTION: Configuration 140C orbiter rudder (identical to

configuration 140A/B rudder)

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-000146B, VL70-000095

DIMENSIONS:	FULL SCALE	MODEL SCALE
Area - Ft ²	100.15	0.010
Span (equivalent), In.	201.0	2.010
Inb'd equivalent chord, In.	91.585	0.916
Outb'd equivalent chord, In.	50.833	0.508
Ratio movable surface chord/total surface chord		
At inb'd equiv. chord	0.400	0.400
At outb'd equiv. chord	0.1400	0.400
Sweep Back Angles, degrees		
Trailing edge	26.25	26.25
Hingeline	34.83	34.83
Area Moment (Product of Area and \overline{c})Ft ³	610.92	0.0006
Mean Aerodynamic Chord, In.	73.2	0.732

MODEL COMPONENT: BOOSTER SOLID ROCKET MOTOR- S24

GENERAL DESCRIPTION: Booster Solid Rocket - Modified Vehicle-5, per

ICD-2-00001, Rev. B

DRAWING NUMBER: SS-A01690, SS-A01667

SCALE: 0.010

DIMENSIONS:	FULL SCALE	MODEL SCALE
Length (Includes Nozzle) - in.	1789.6	17.896
Max. Width (Tank Dia.) - in.	150.0	1.500
Max. Depth (aft Shroud) - in.	208.0	2.08
Fineness Ratio	11.931	11.931
Area - Ft ²		
Max. Cross-Sectional	236.0	•02360
Planform		
Wetted		
Base		
WP of BSRM Centerline $(\mathbf{Z}_{\mathrm{T}})$ - in.	400.00	4.000
FS of BSRM Nose (X_T) - in.	200.00	2.000

MODEL COMPONENT: EXTERNAL TANK T35

GENERAL DESCRIPTION: Spike nose configuration, updated Vehicle-5

(Dimensions are to tank structural OML, TPS included.).

MODEL SCALE: 0.010

DRAWING NUMBER: VC78-000002A, ICD-2-00001, Rev. B, VC72-000002E

DIMENSIONS:	FULL SCALE	MODEL SCALE
Length, In.	1852,500	18.525
Max Width, In.	336.000	3.360
Max Depth, In.	336.000	3 .3 60
Fineness Ratio	5-513	5.513
Area - Ft ²		
Max. Cross-Sectional	615.752	.06158
Planform		
Wetted	qui das	
Base	604.806	.06048

MODEL COMPONENT:

VERTICAL - V8

GENERAL DESCRIPTION: Configuration 140A/B orbiter vertical tail

MODEL SCALE: 0.010 MODEL DRAWING: SS-A00148, Release 6

DRAWING NUMBER: VL70-000146A

DIMENSIONS: TOTAL DATA	FULL SCALE	MODEL SCALE
•		
Area (Theo) - Ft ²		
Planform	413.253	0.041
Span (Theo) - In.	315.720	3.157
Aspect Ratio	1.675	1.675
Rate of Taper	0.507	0.507
Taper Ratio	0.404	0.404
Sweep-Back Angles, Degrees		_
Leading Edge	45.00	45.00
Trailing Edge	26.2	26.2
O.25 Element Line	41.130	41.130
Chords:		
Root (Theo) WP	268.500	2.685
Tip (Theo) WP	108.470	1,085
MAC	199.808	1.998
Fus. Sta. of .25 MAC	1463.50	14.635
W.P. of .25 MAC	635.522	6.355
B.L. of .25 MAC	0.0	0.0
Airfoil Section		
Leading Wedge Angle - Deg.	10.0	10.0
Trailing Wedge Angle - Deg.	14.920	14.920
Leading Edge Radius	5.00	0.020
Void Area	13.17	0.001
Blanketed Area	0.0	0.0

TABLE III. MODEL DIMENSIONAL DATA (Concluded) WING-W127

MODEL COMPONENT:

GENERAL DESCRIPTION: Configuration 140C, orbiter wing, MCR 200-R4, similar to 140A/B wing W116 but with refinements: improved wing-bootmidbody fairing ($X_0 = 940$ to $X_0 = 1040$); elevon split line relocated from $Y_0 = 281$ to $Y_0 = 312.5$. MODEL SCALE:0.010 DWG.NO: VL70-000140C,-000200B DIMENSIONS: FULL SCALE MODEL SCALE TOTAL DATA Area (Theo.) Ft2 2690.00 Planform 0.2690 Span (Theo) In. 936.68 9.3668 2,265 Aspect Ratio 2.265 Rate of Taper 1,177 Taper Ratio 0.200 0.200 3.500 3.500 Dihedral Angle, degrees Incidence Angle, degrees 0.500 0.500 Aerodynamic Twist, degrees 3.000 3.000 Sweep Back Angles, degrees 45.000 45.000 Leading Edge Trailing Edge - 10.056 - 10.056 0.25 Element Line 35.209 35,209 Chords: Root (Theo) B.P.O.O. 689.24 6.892 1.379 Tip (Theo) B.P. 137.85 4.748 MAC 474.81 Fus. Sta. of .25 MAC 1136.83 11.368 2,906 W.P. of .25 MAC 290.58 B.L. of .25 MAC 1.821 182.13 EXPOSED DATA Area (Theo) Ft2 1751.50 0.1752 Span (Theo) In. BP108 720.68 7.207 2.059 2,059 Aspect Ratio 0.245 0,245 Taper Ratio Chords 5.621 Root BP108 562.09 Tip 1.00 b/2 137.85 1.379 392.83 3.928 MAC 11,860 1185.98 Fus. Sta. of .25 MAC W.P. of .25 MAC 294.30 2.943 251.77 B.L. of .25 MAC 2.518 Airfoil Section (Rockwell Mod NASA)XXXX-64 0.113 Root b/2 0.113 0.12 Tip b/2 0.12 Data for (1) of (2) Sides Leading Edge Cuff, Planform Area Ft2

Leading Edge Intersects Fus M.L. @ Sta

Leading Edge Intersects Wing @ Sta

113.18

500,00

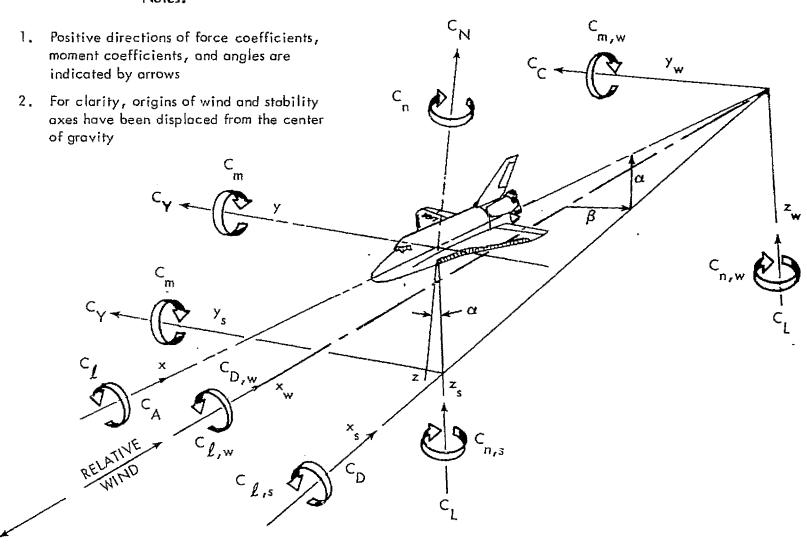
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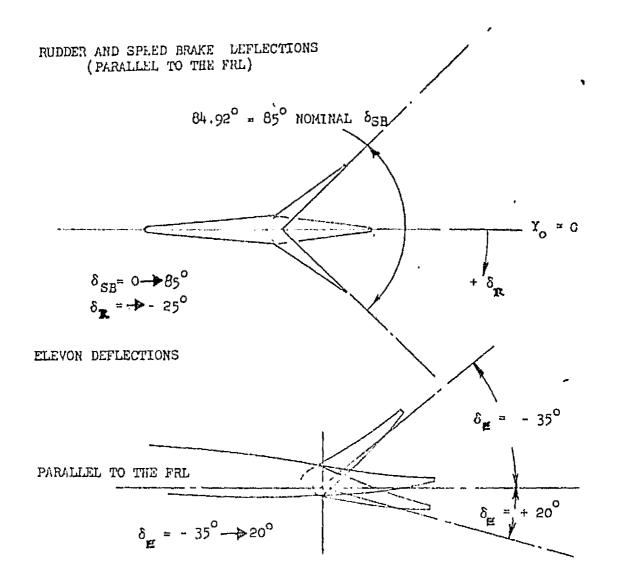
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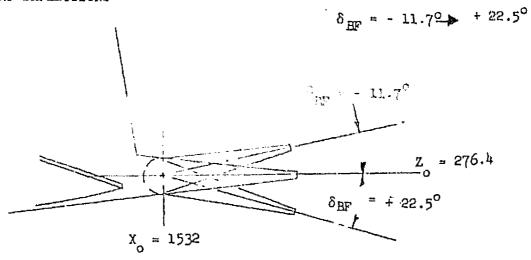


a. General

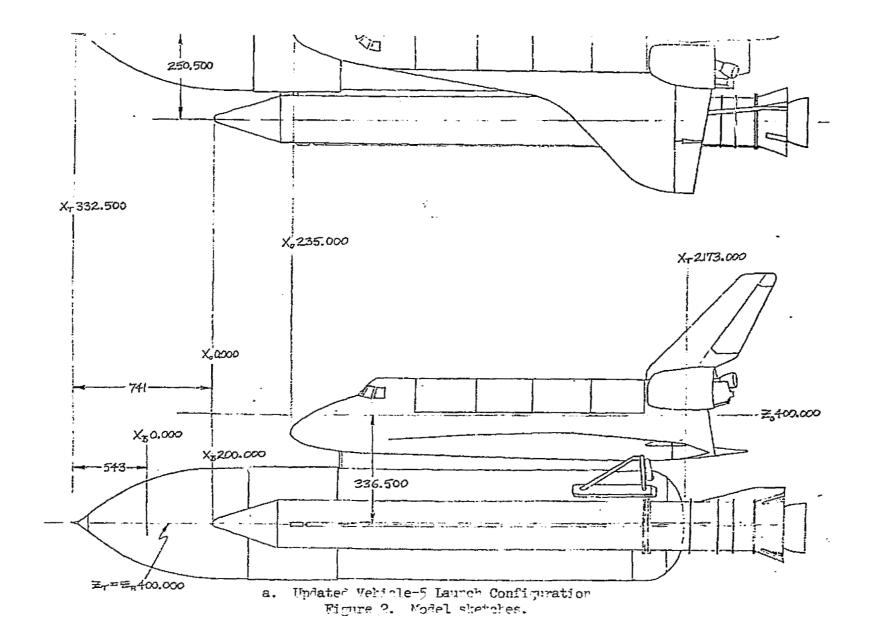
Figure 1. Axis Systems

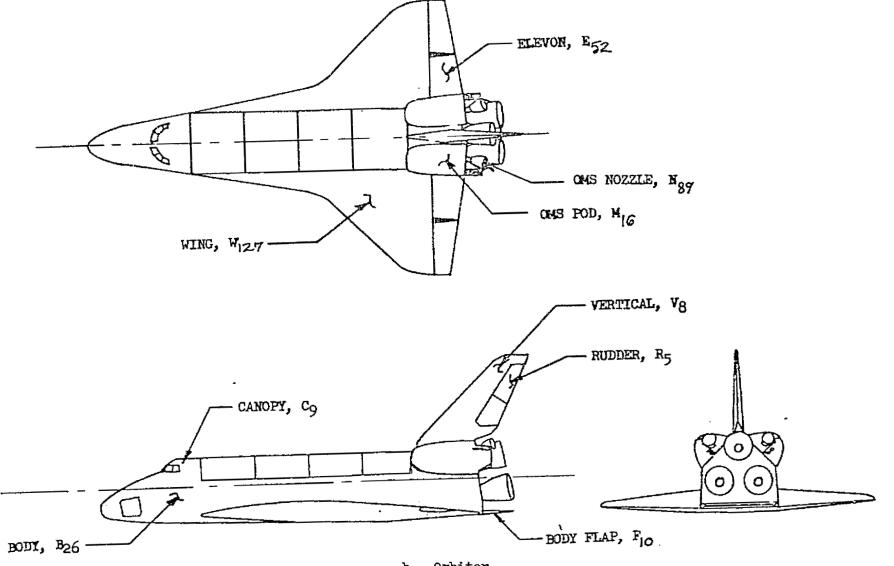


BODY FLAP DEFLECTIONS

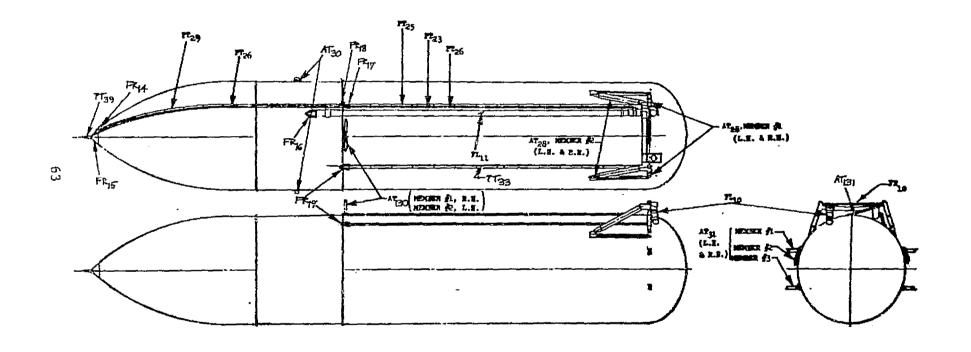


b. Coutrol Curfacer Figure 3. Continued.



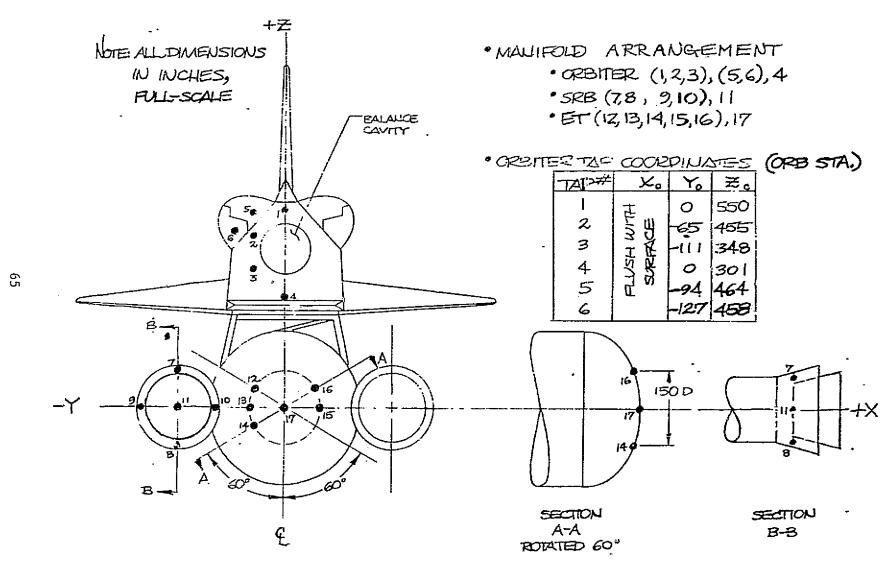


b. OrbiterFigure 2. Continued.



o. External Tank Figure 2. Continued.

i. Solid Rocket Booster Figure 2. Continued.



e. Base Pressure Tap Locations Figure 2. Corplyded.

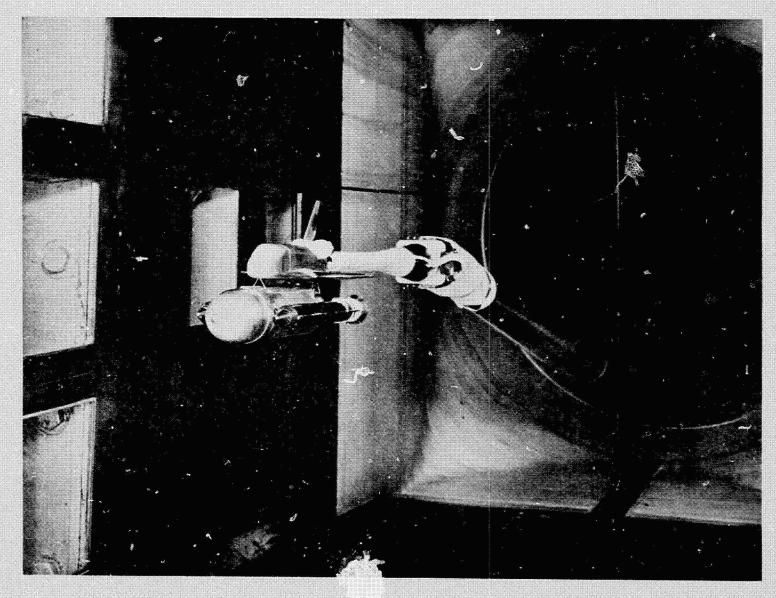


Figure 3. Model installation photograph.

DATA FIGURES

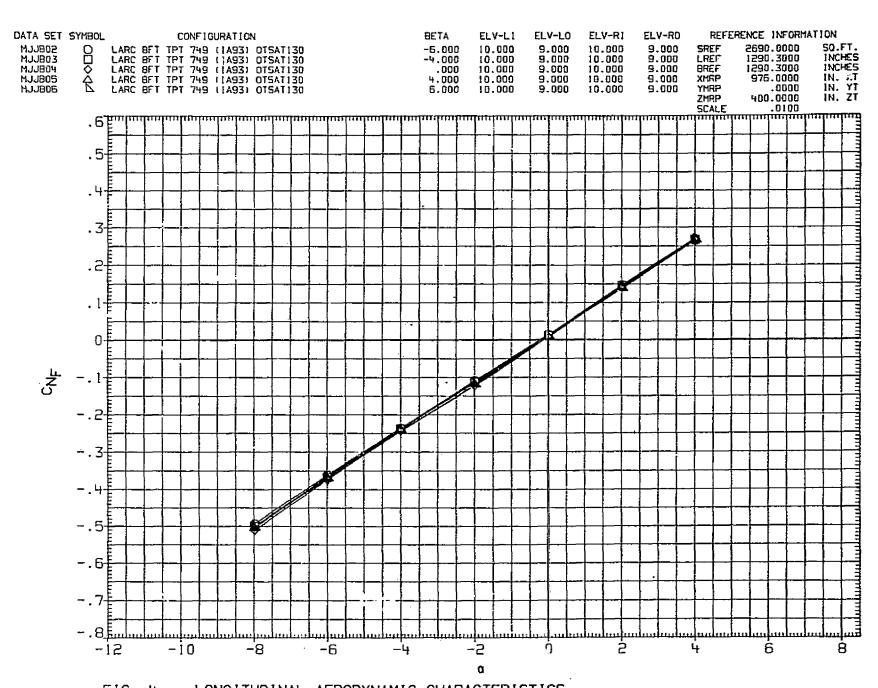


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

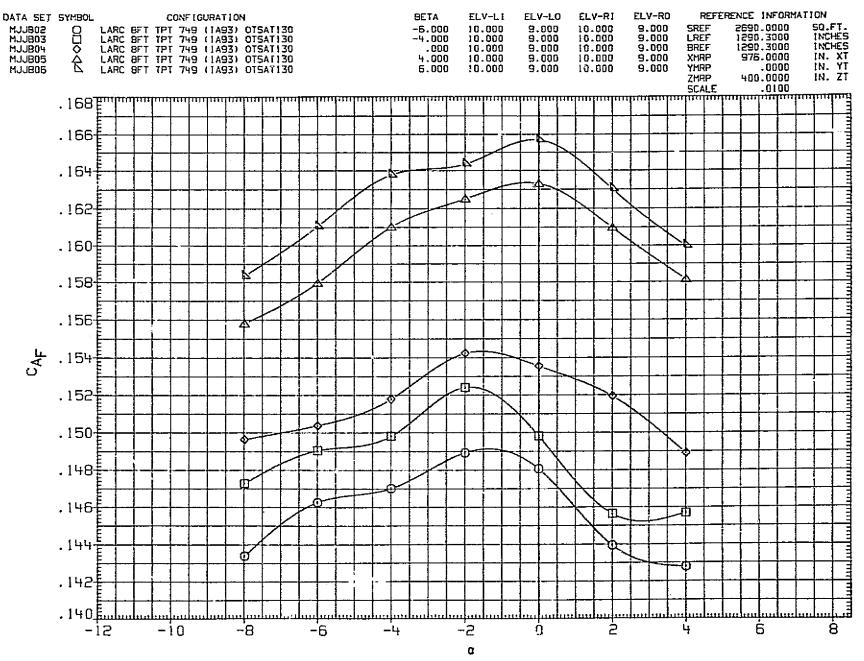


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

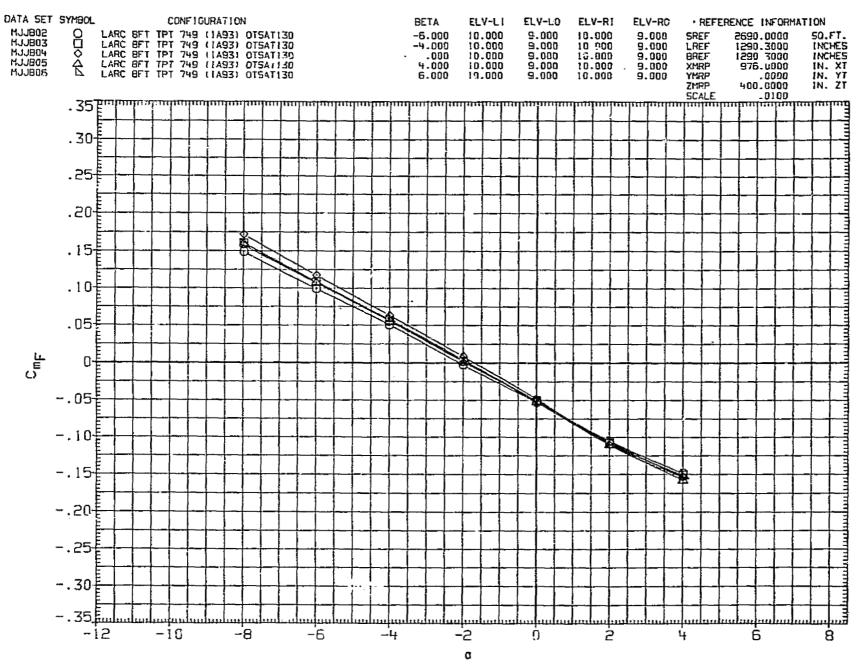


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

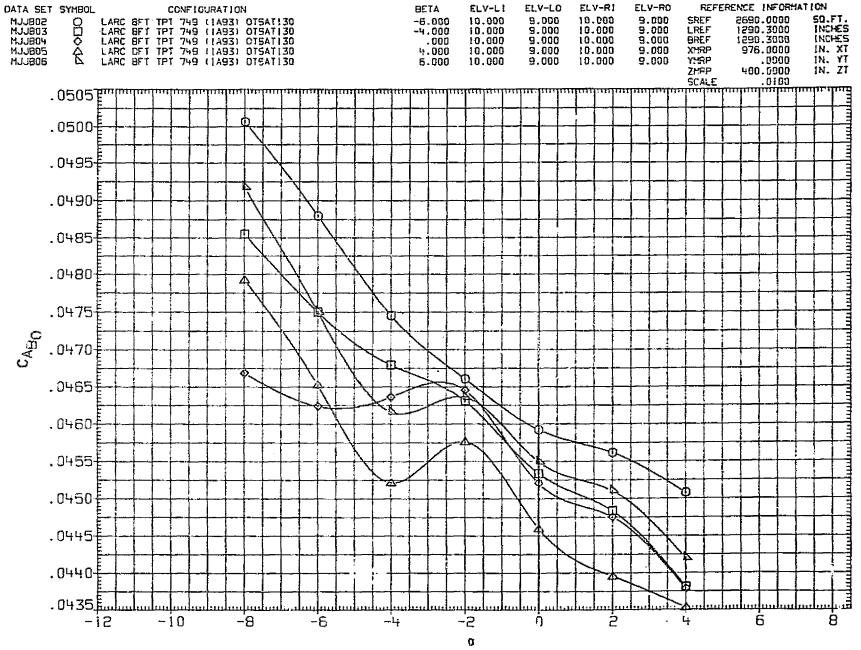


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

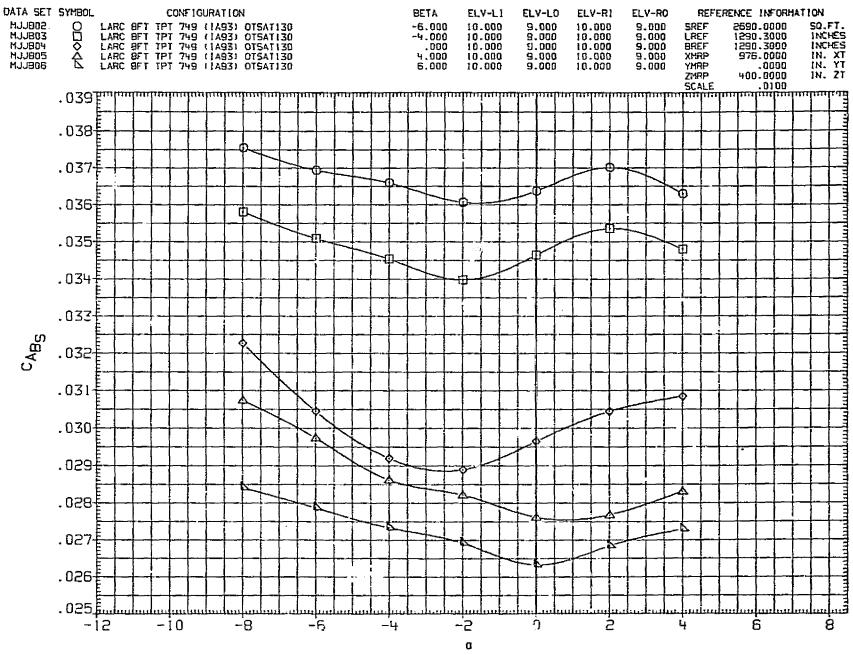
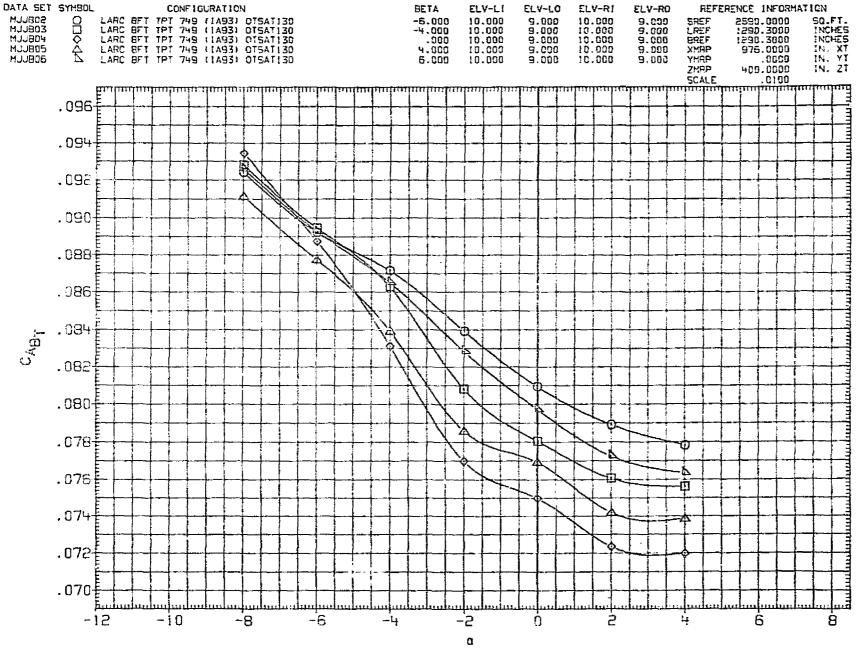


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



6

FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

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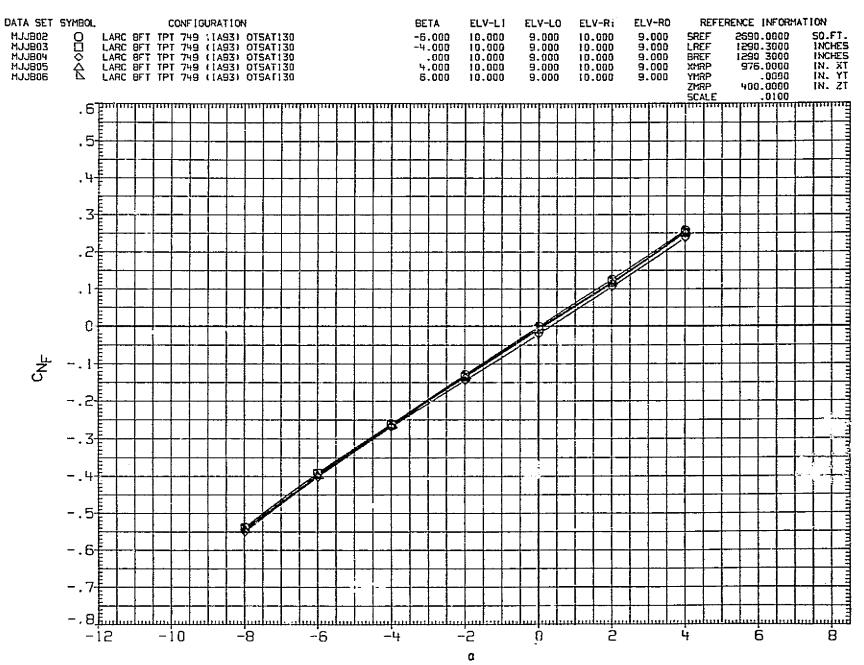


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

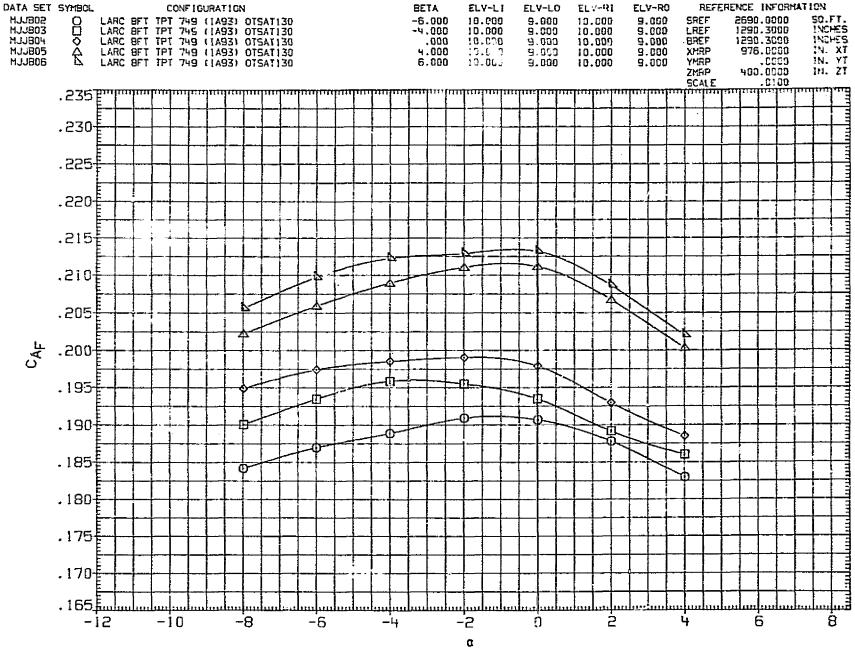


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

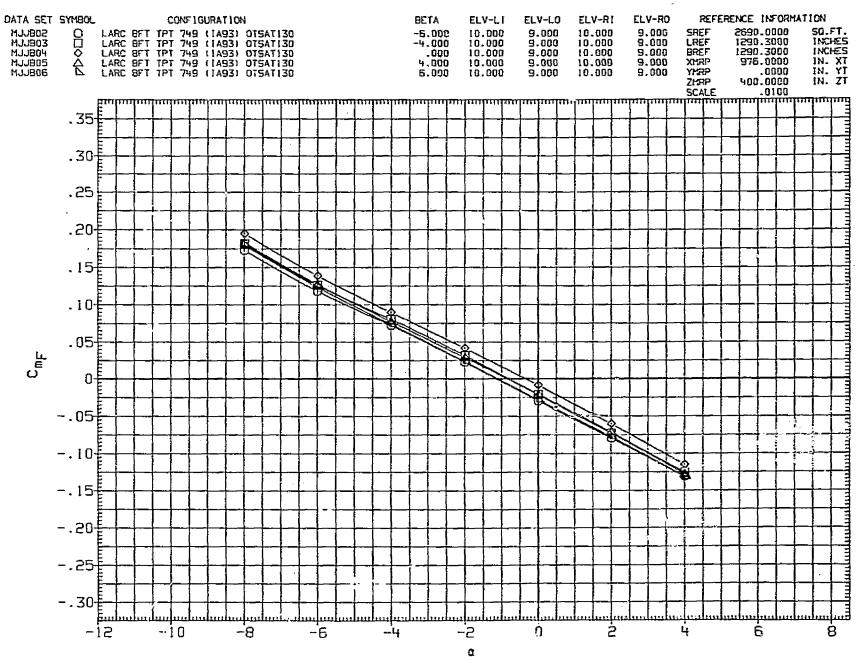


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

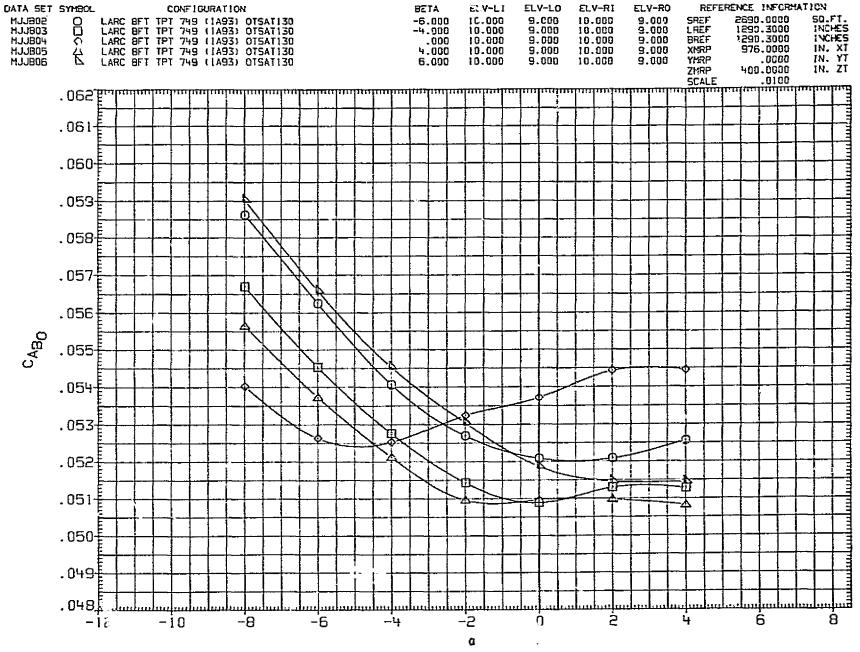


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

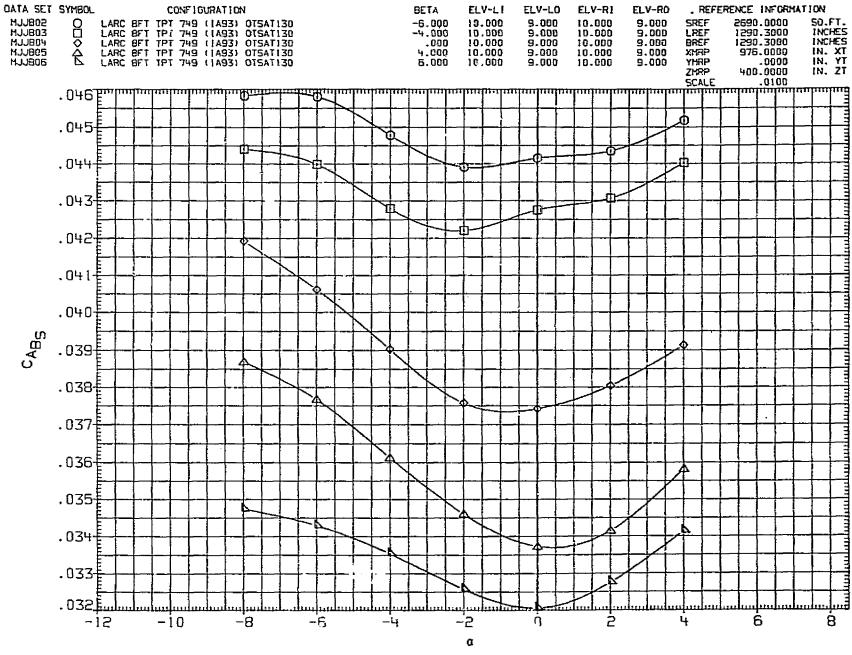


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

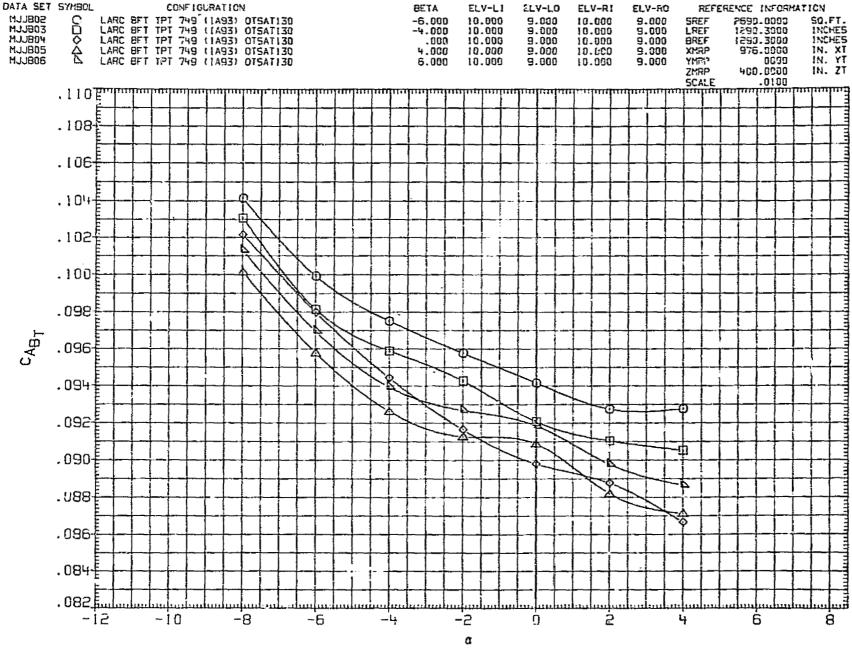


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B) MACH = .98 PAGE 12

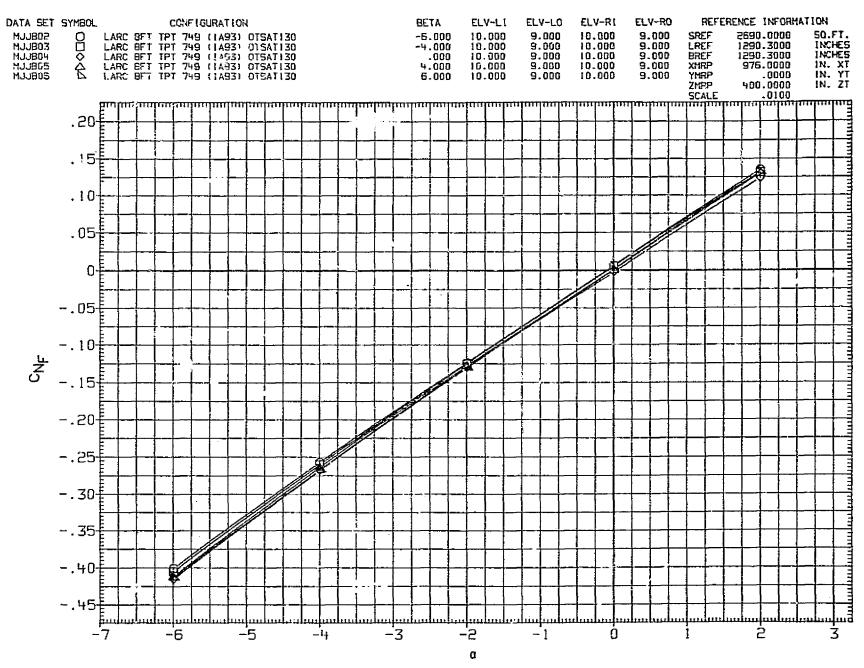


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

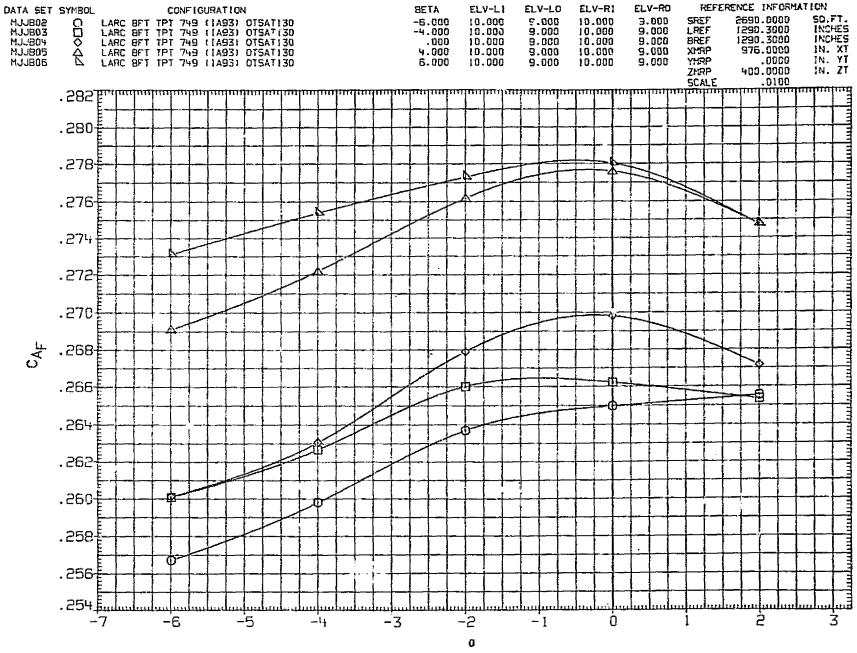


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

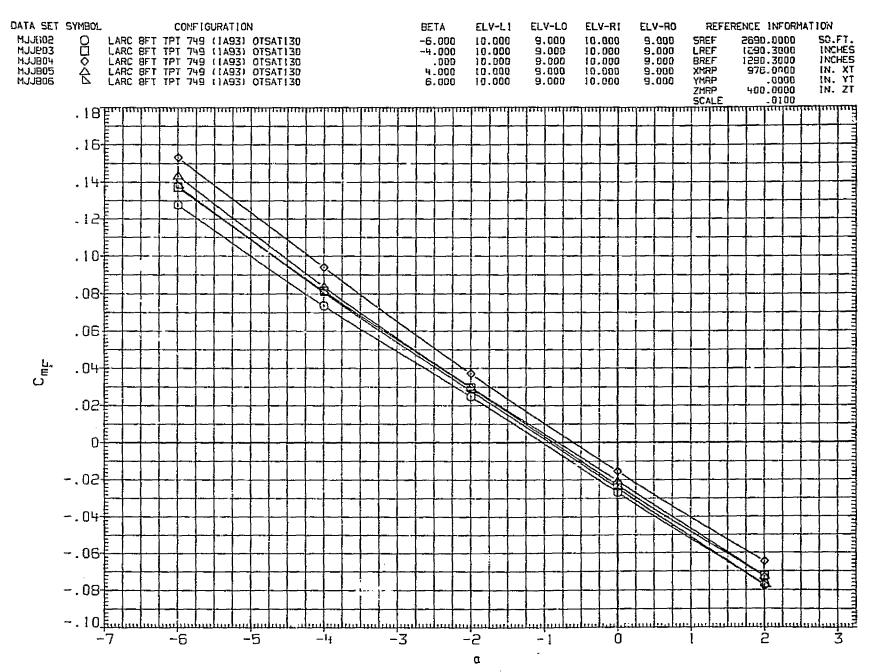


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

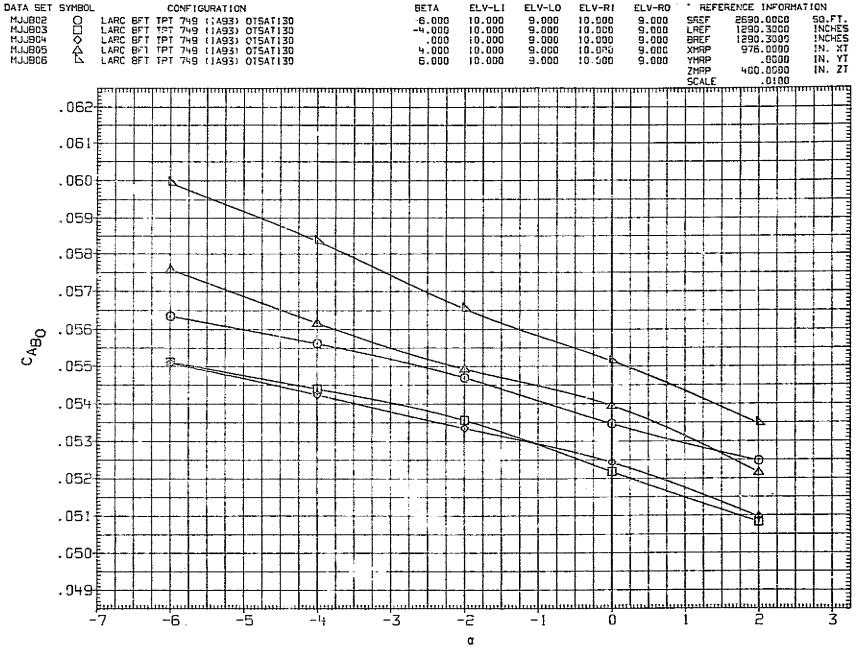
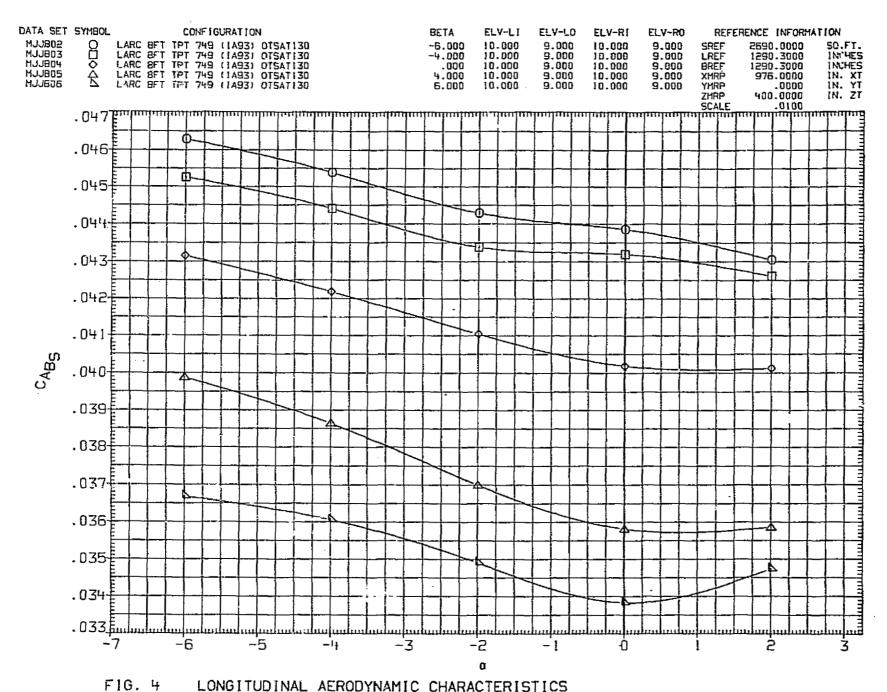


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(C)MACH = 1.15

PAGE



2......

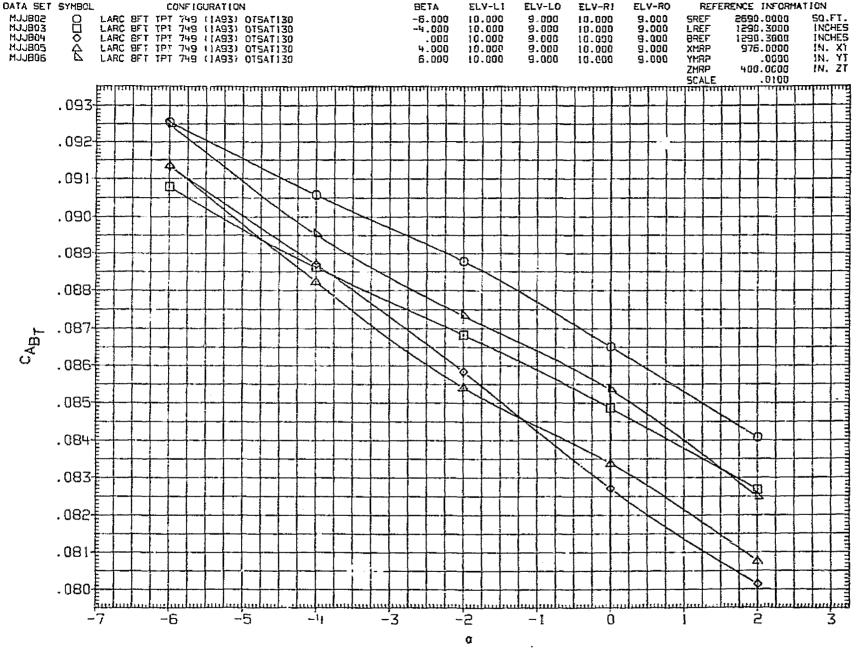


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

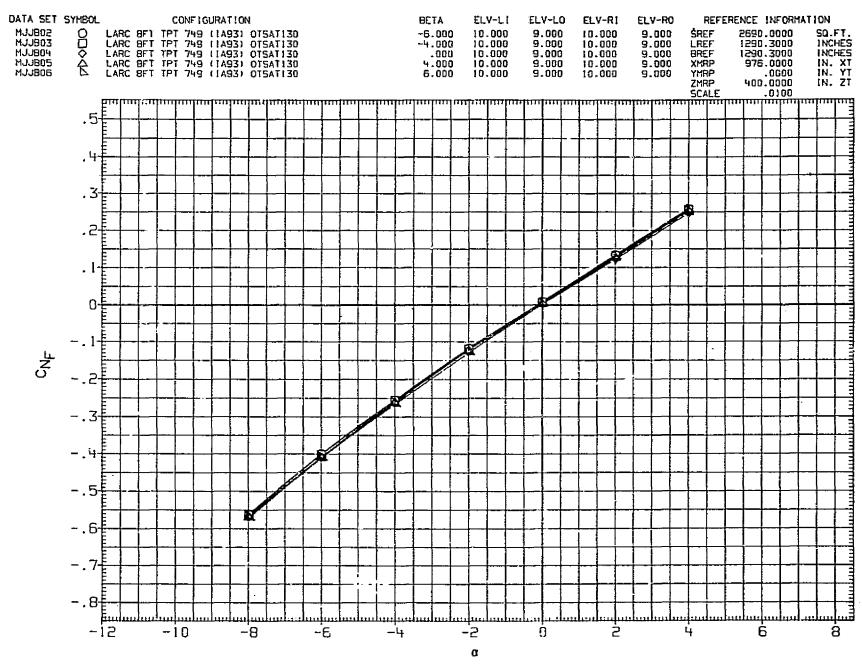


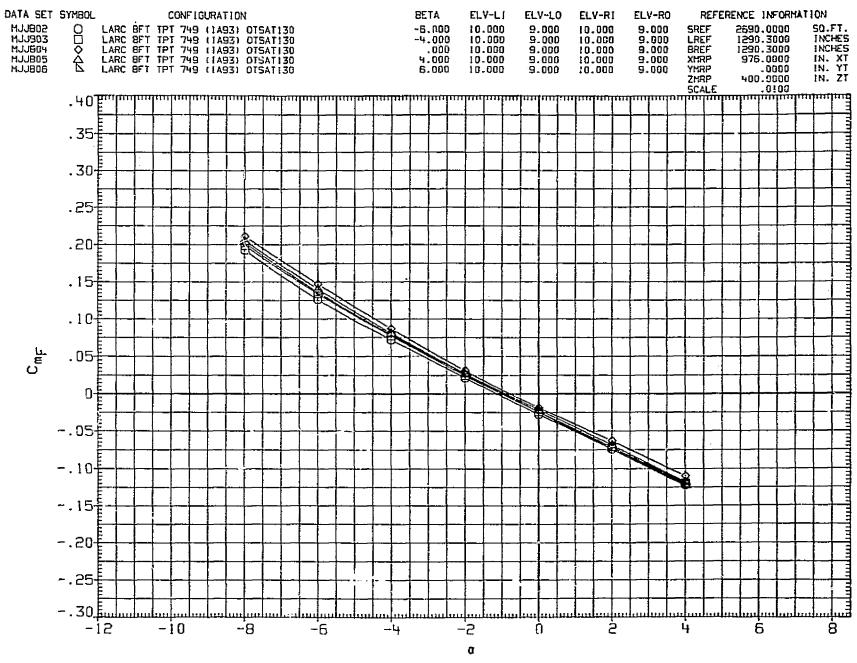
FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20 PAGE



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20



PAGE

FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20

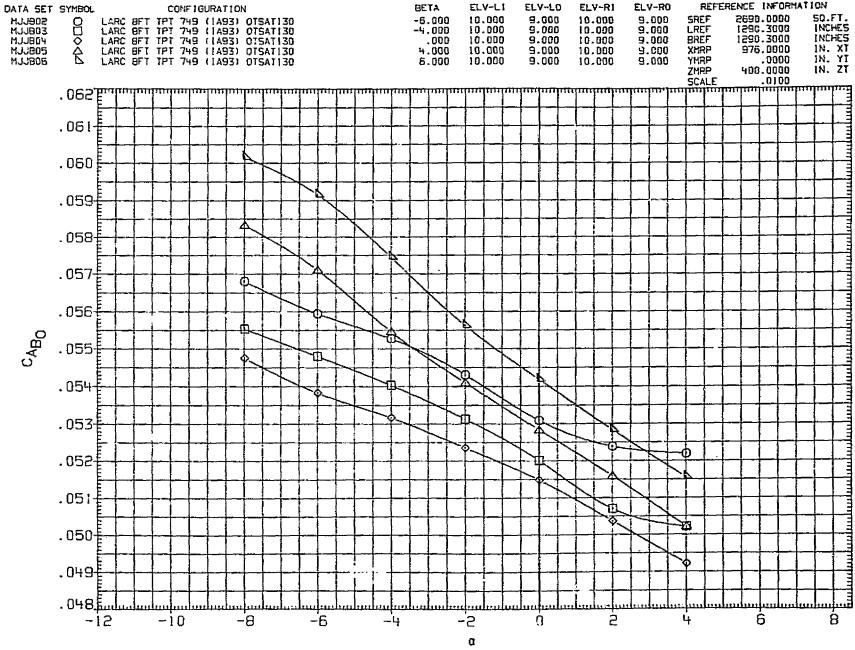


FIG. 4 LONGITUDINAL ACRODYNAMIC CHARACTERISTICS

(D)MACH = 1.20 PAGE



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

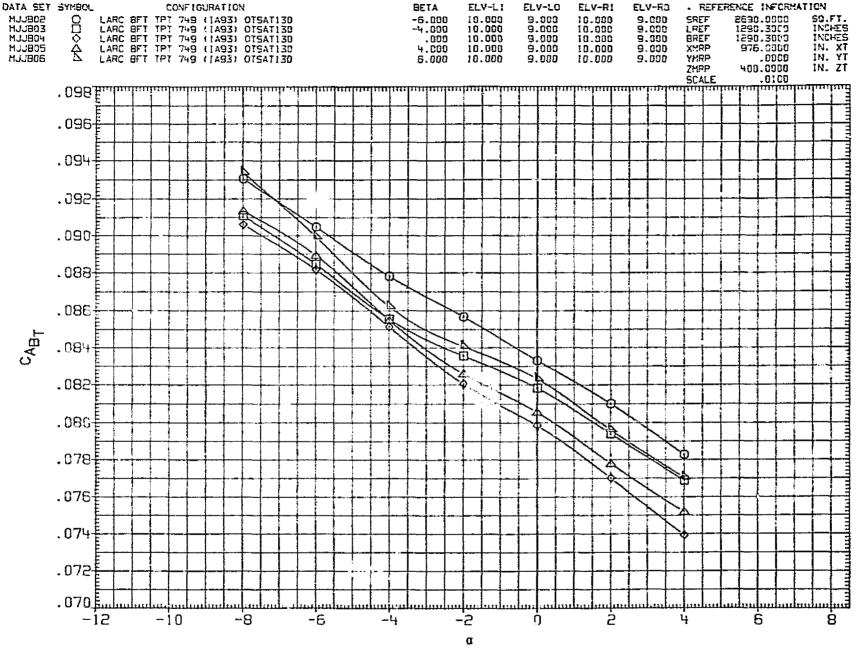


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

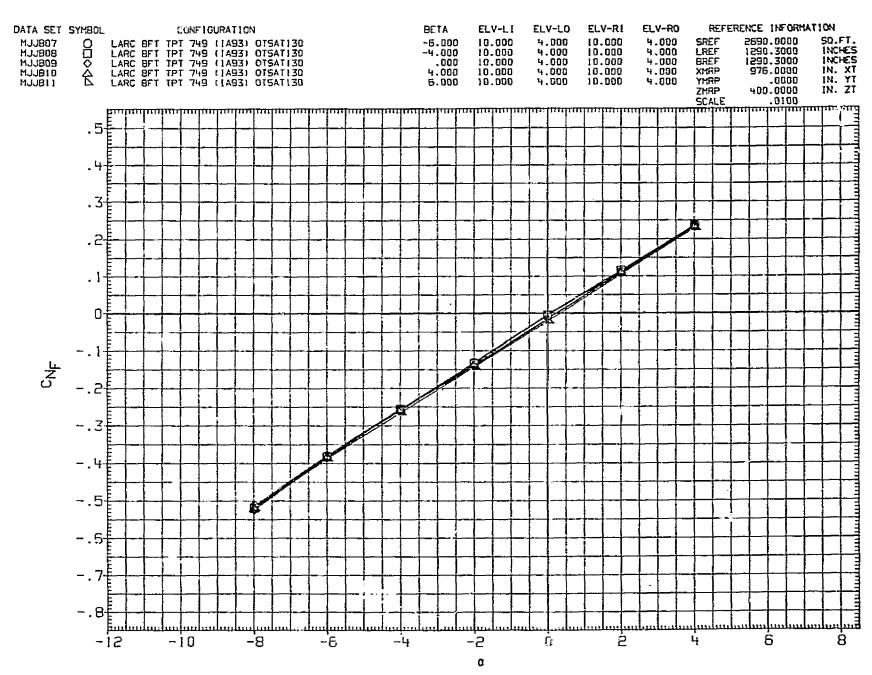


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

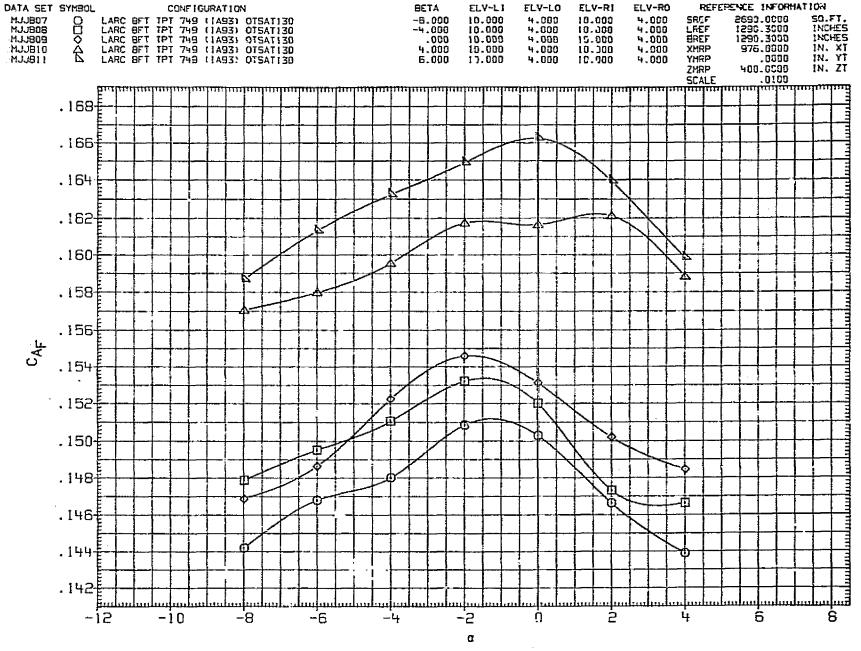


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

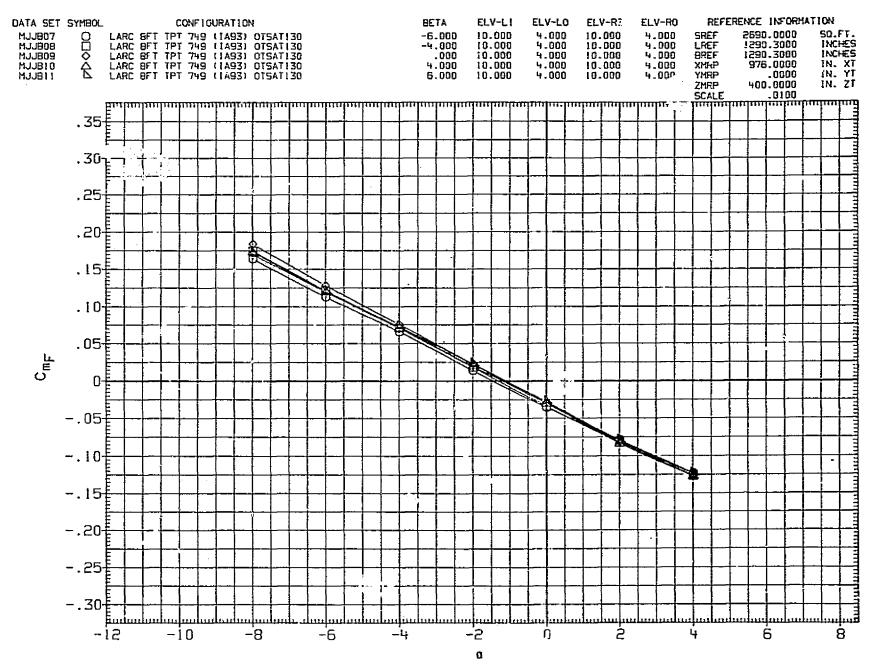


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

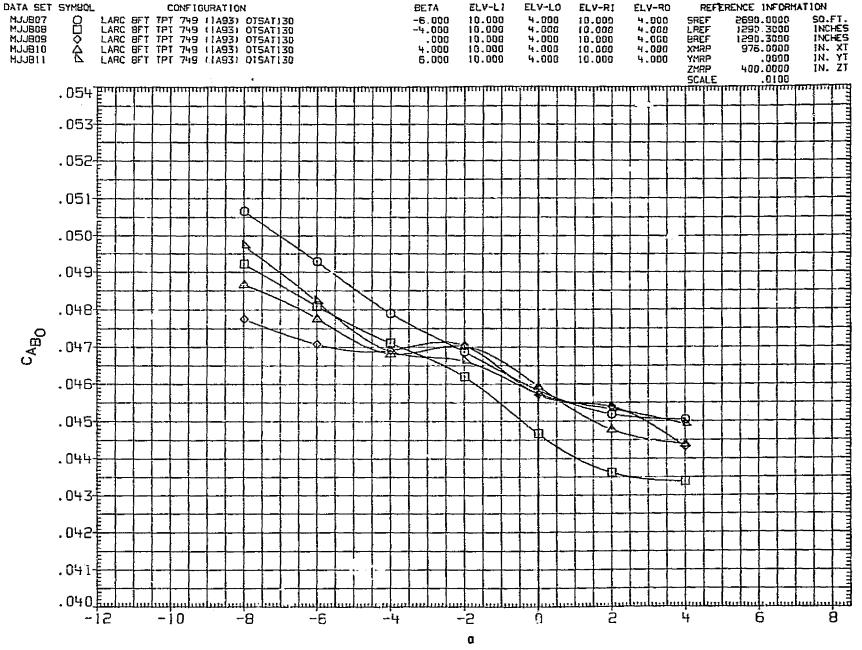


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

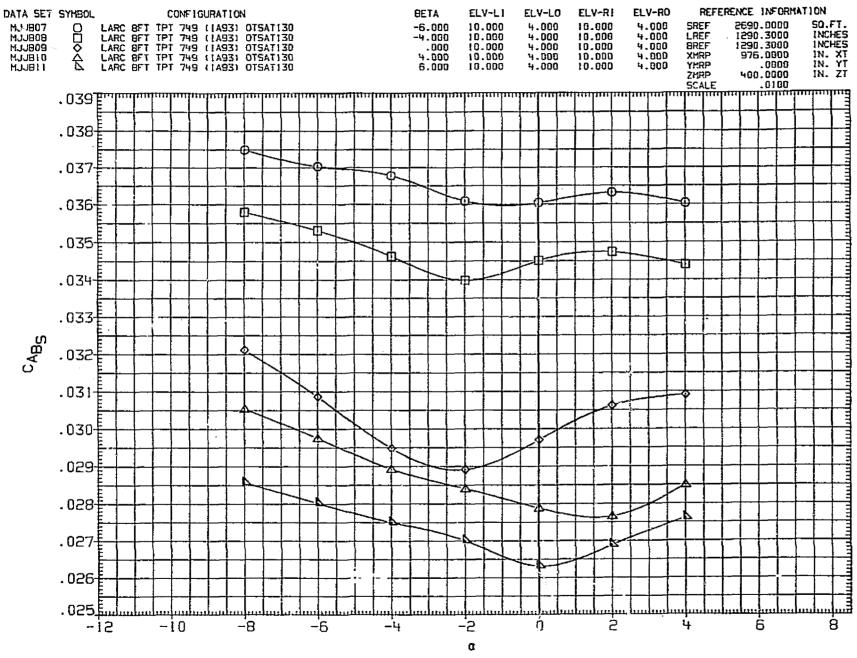


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

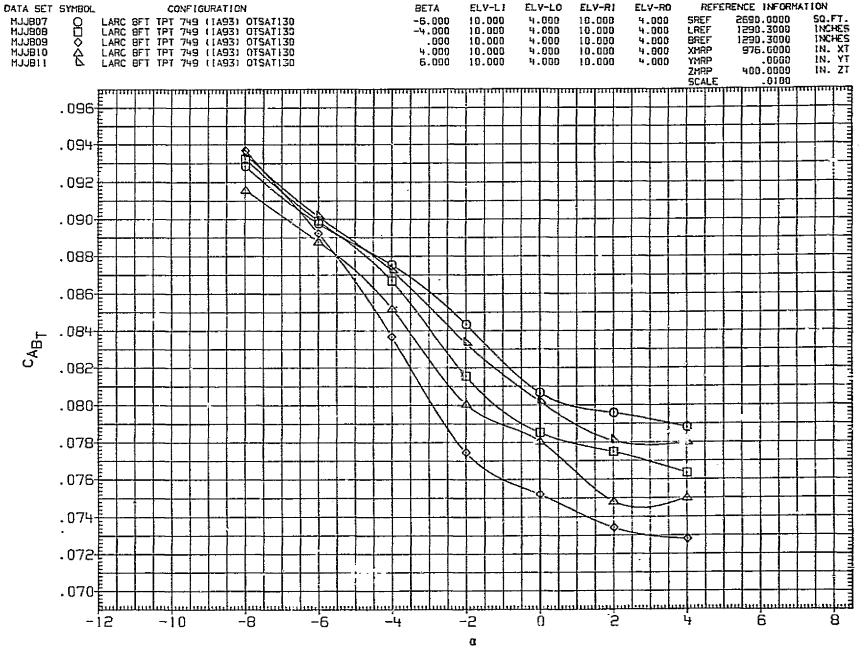


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

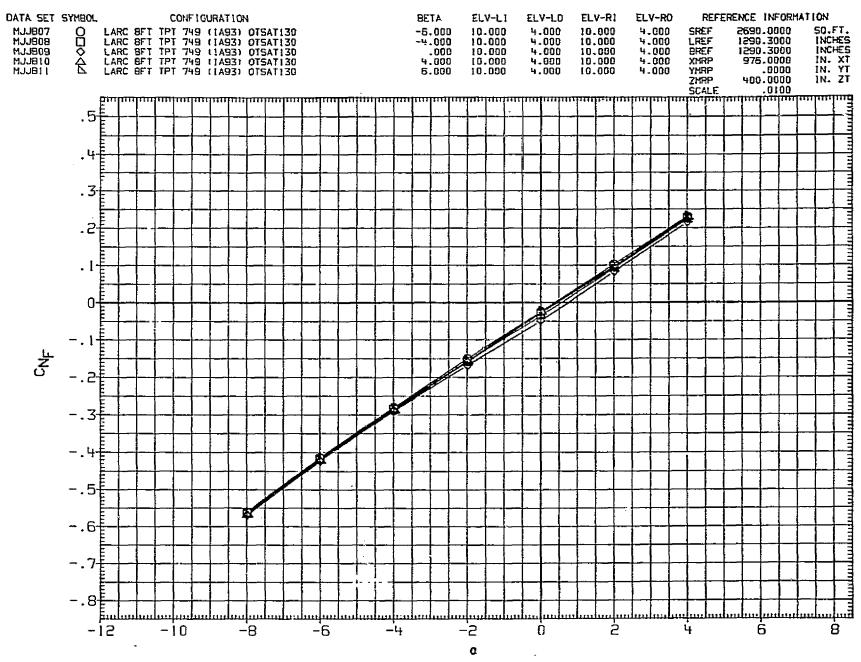


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

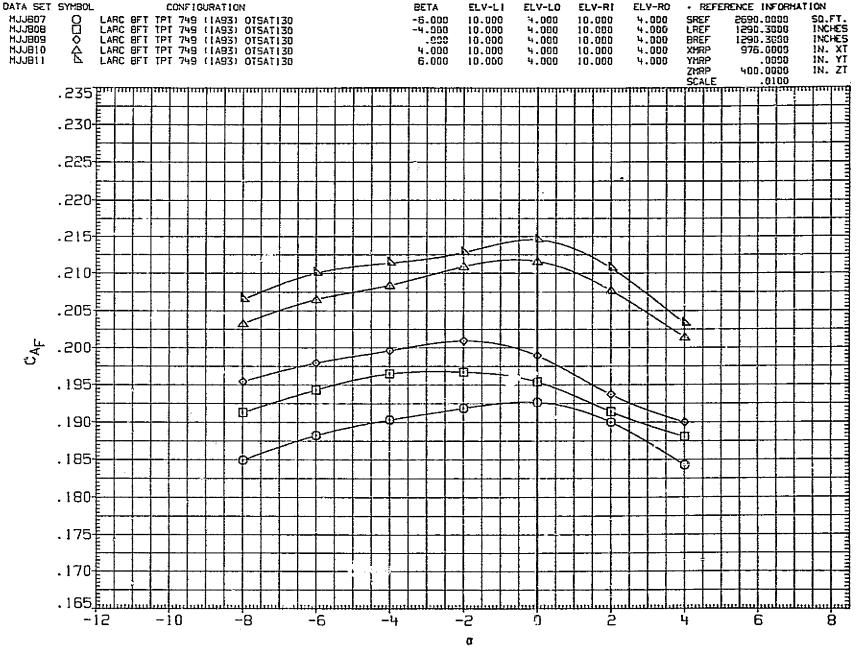


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

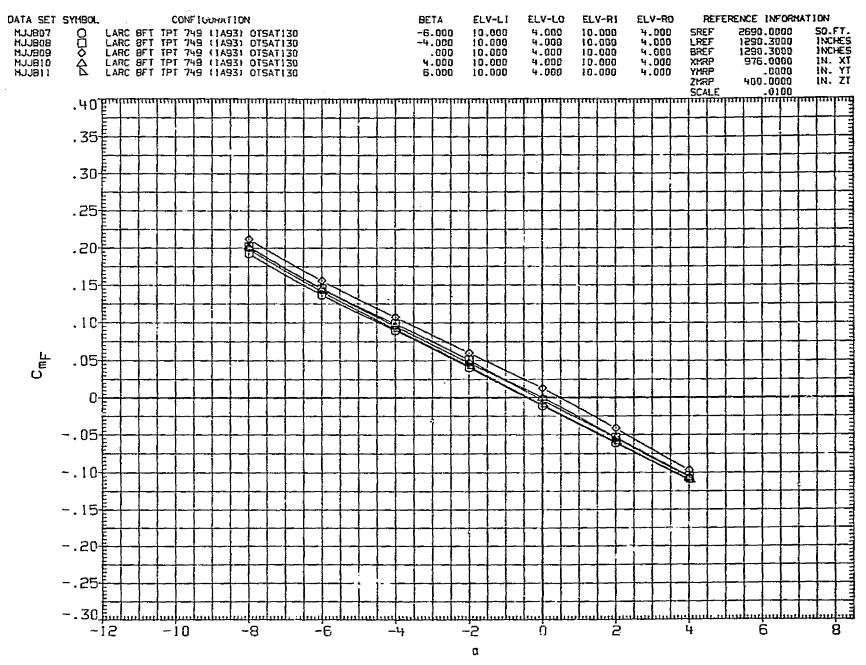


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

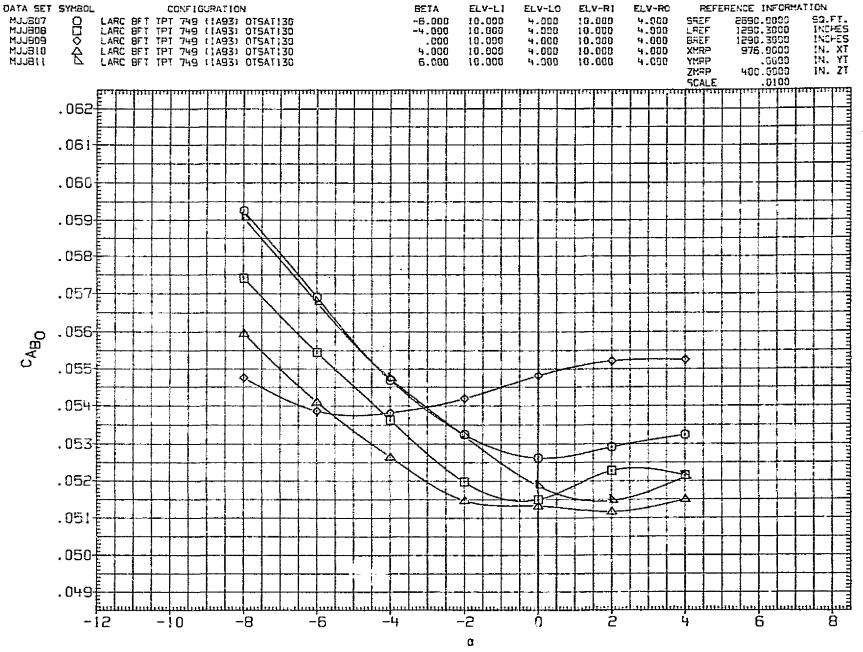


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

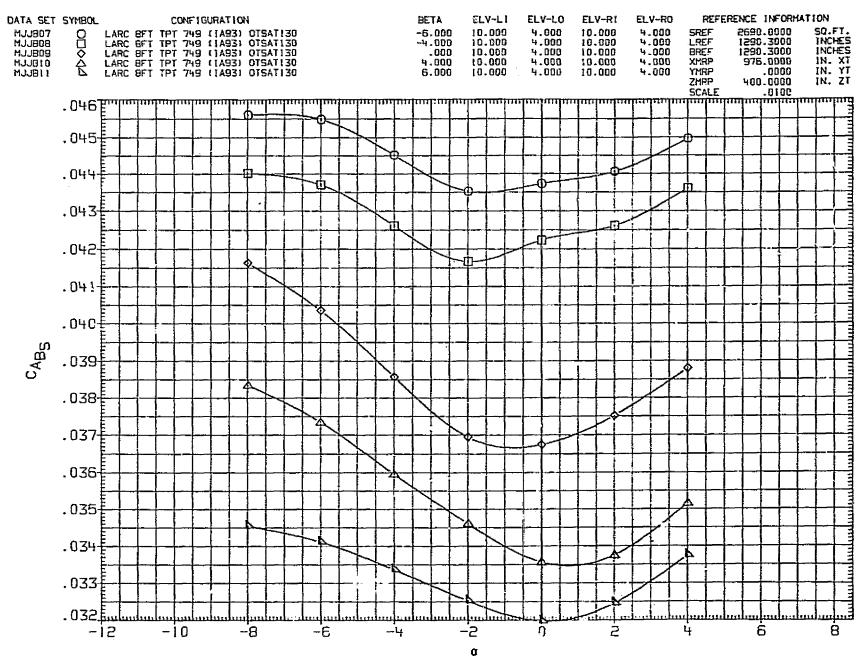


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

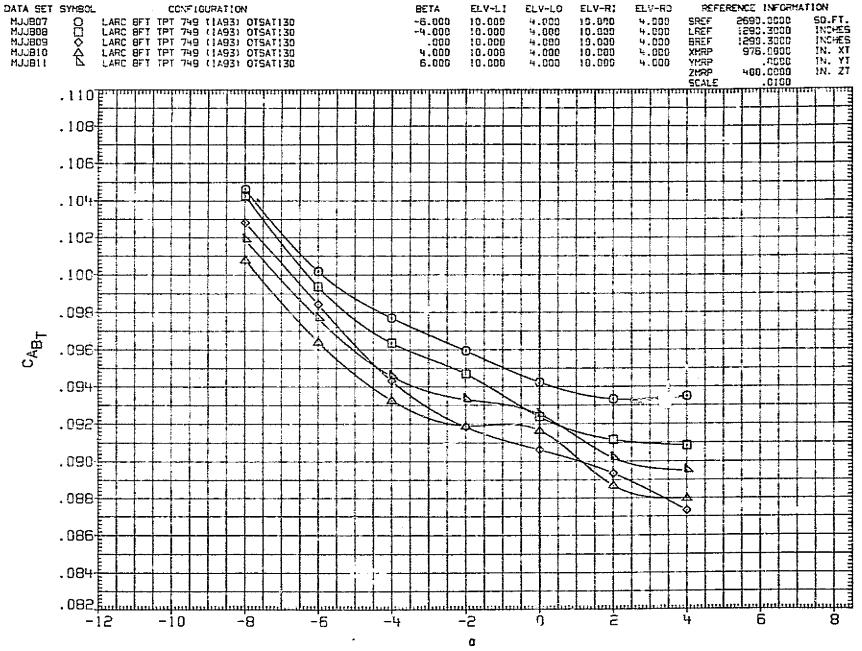


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

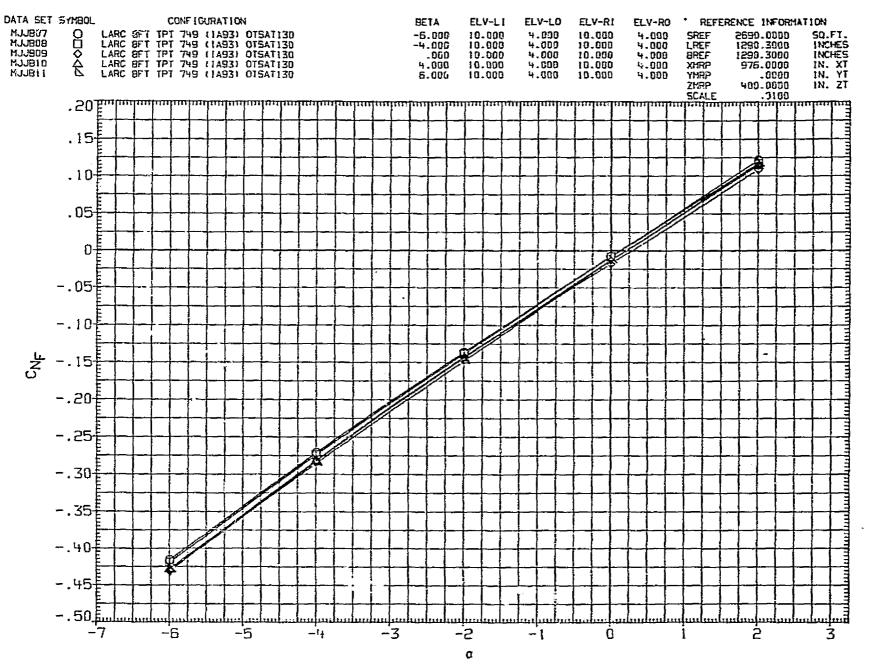


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

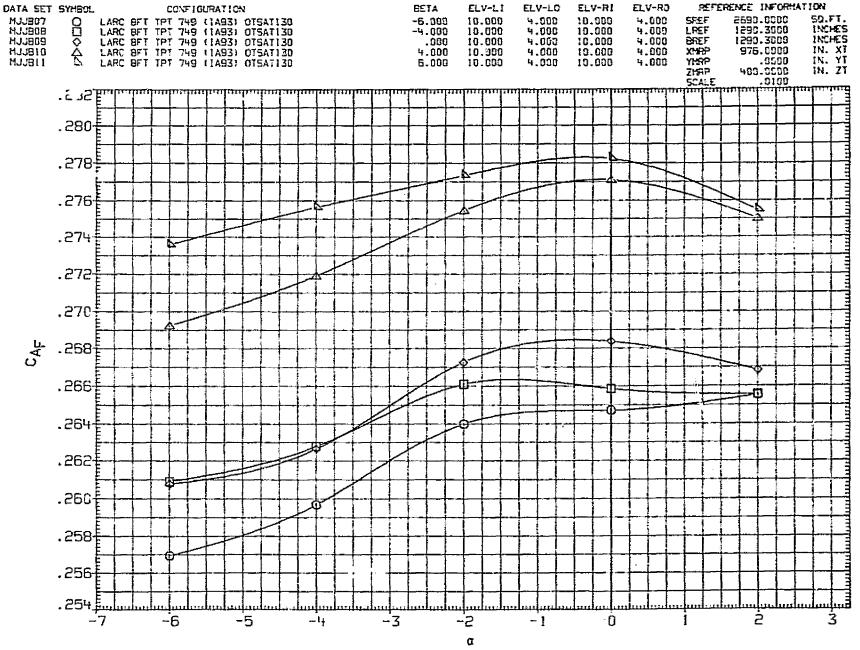


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(C)MACH = 1.15

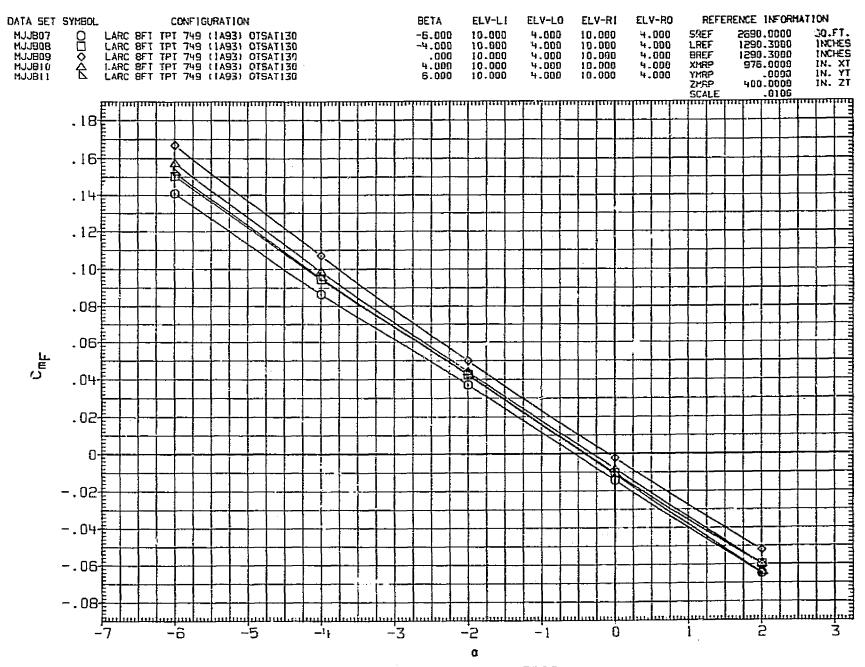


FIG. 4 LONGITUDINAL AERODYNAMI. CHARACTERISTICS

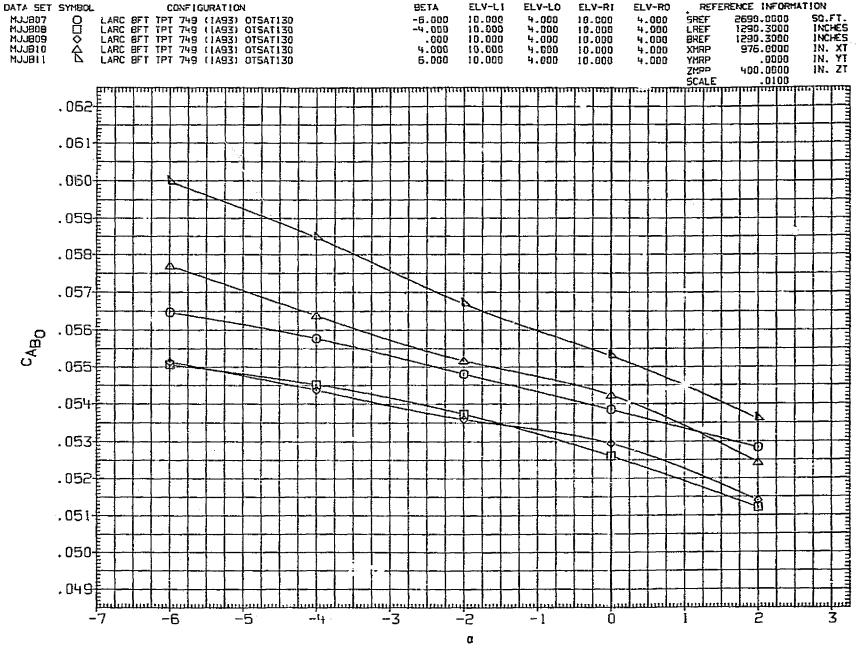


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

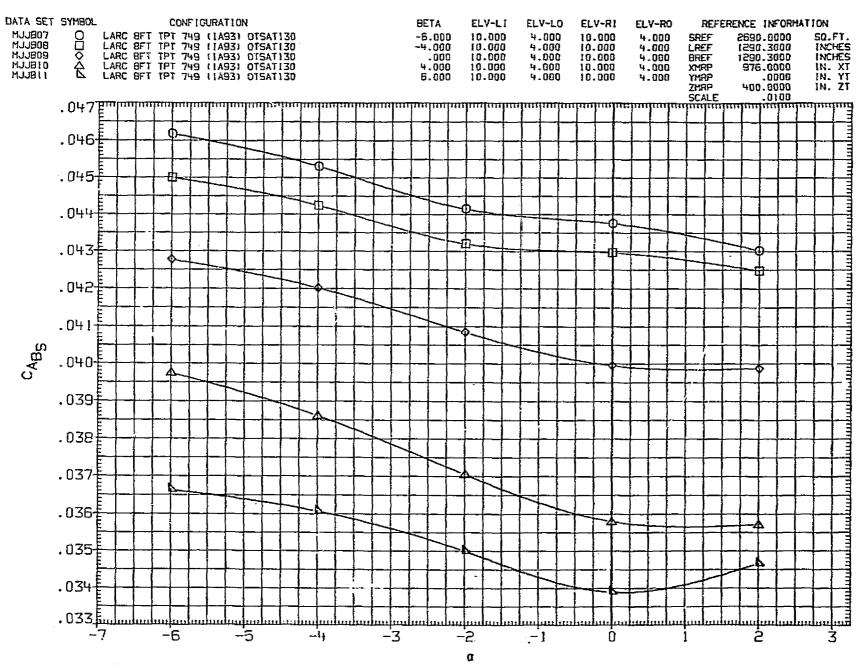


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(C)MACH = 1.15



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

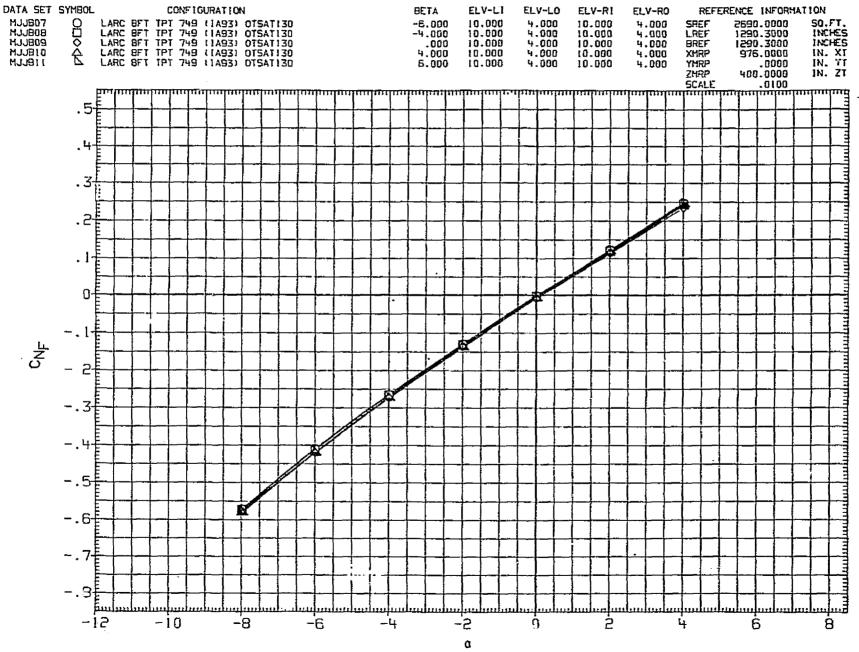


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20

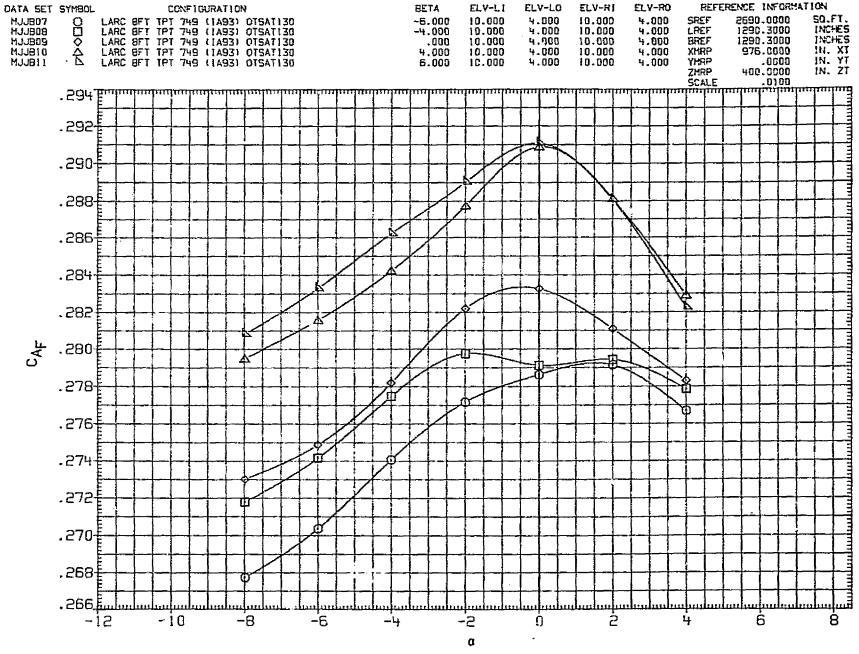


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

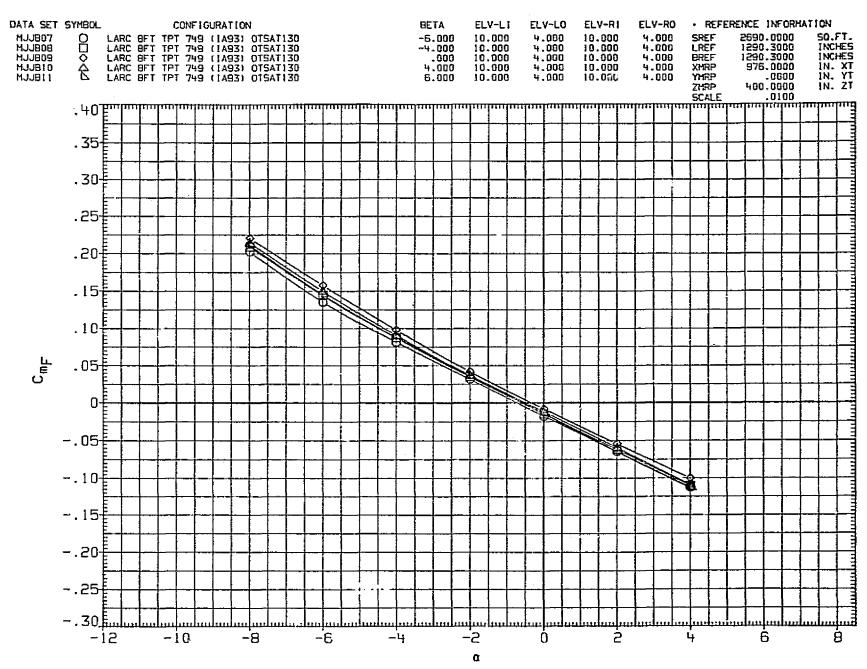


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

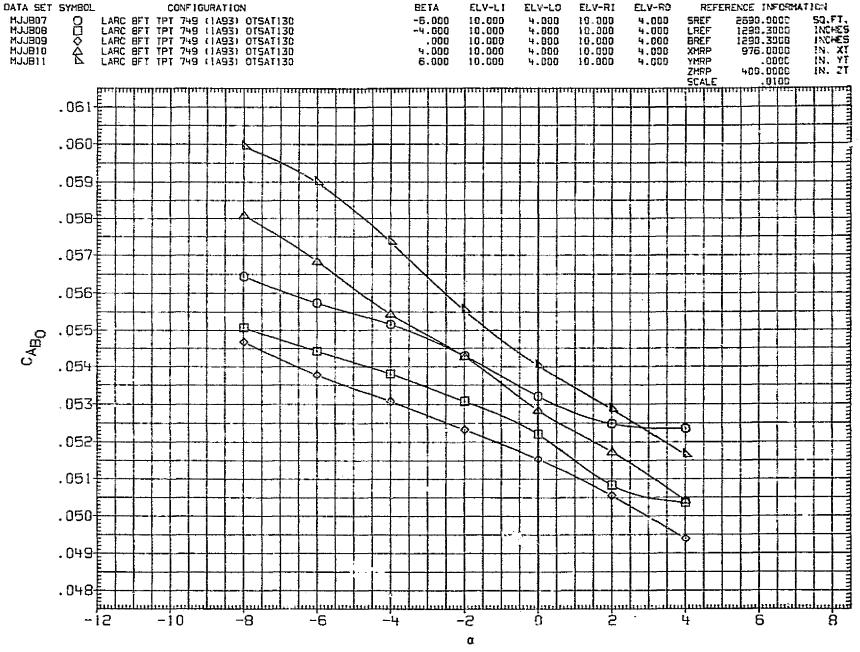


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D) MACH = 1.20 PAGE 46

REPRODUCIBILITY OF ORIGINAL PAGE IS POOR

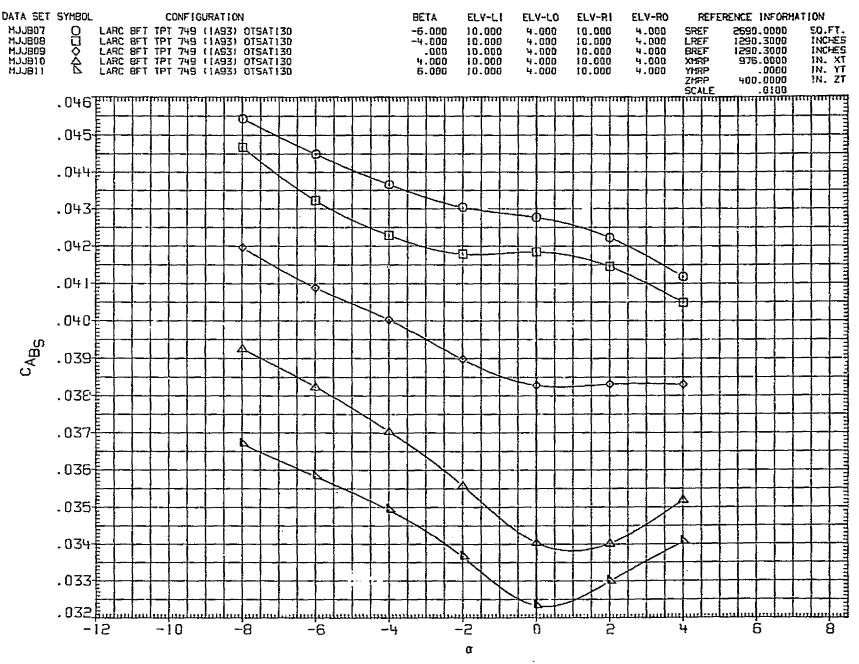


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

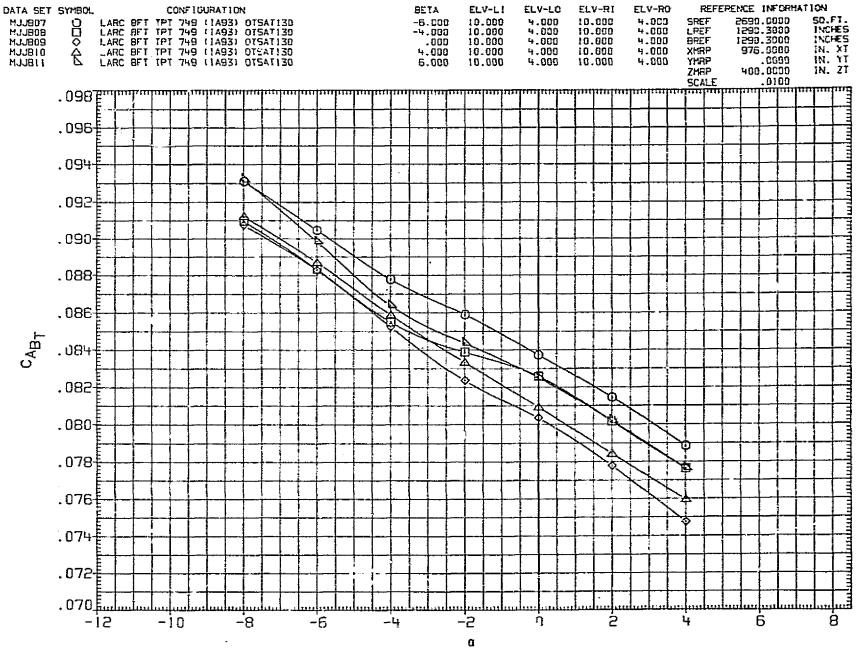


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

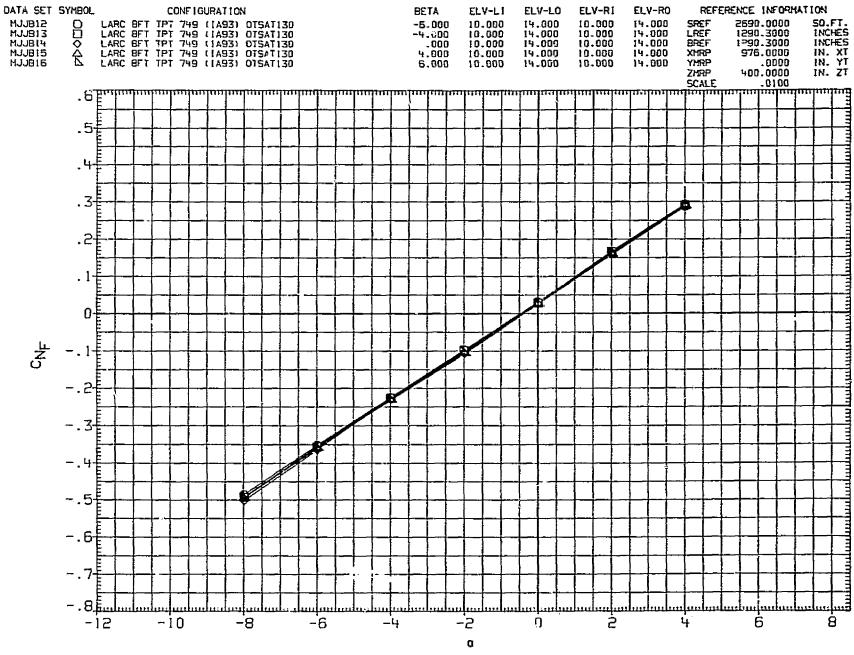


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

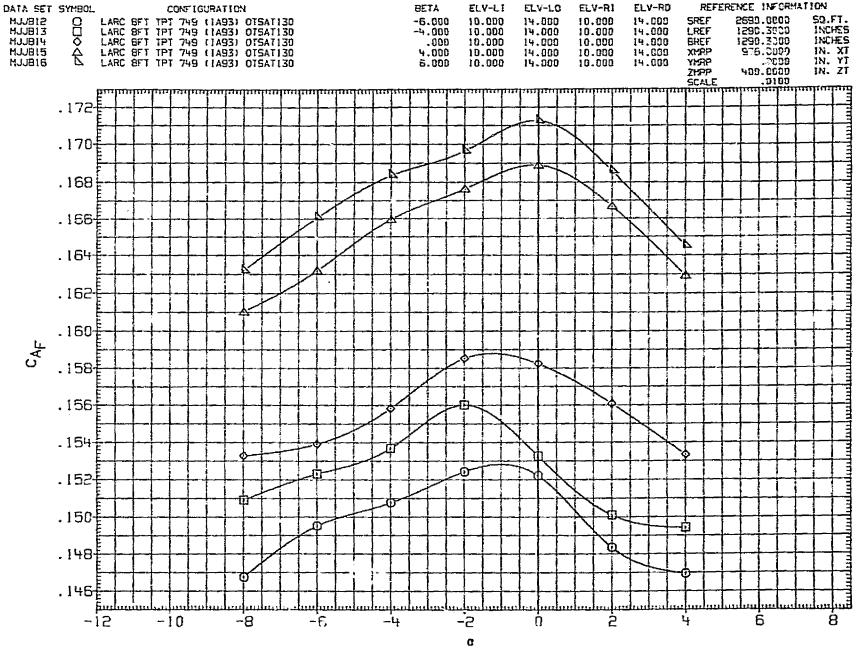


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

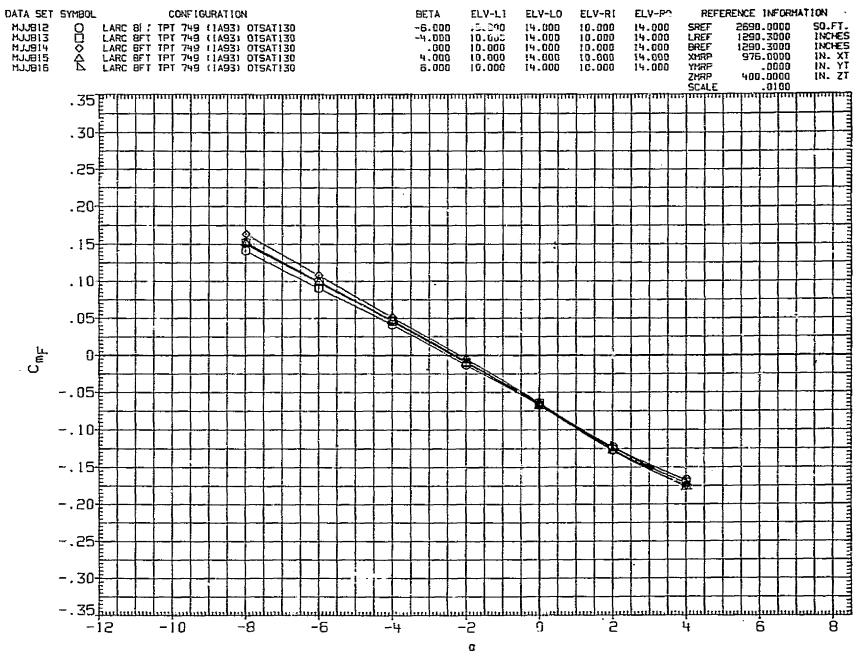


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

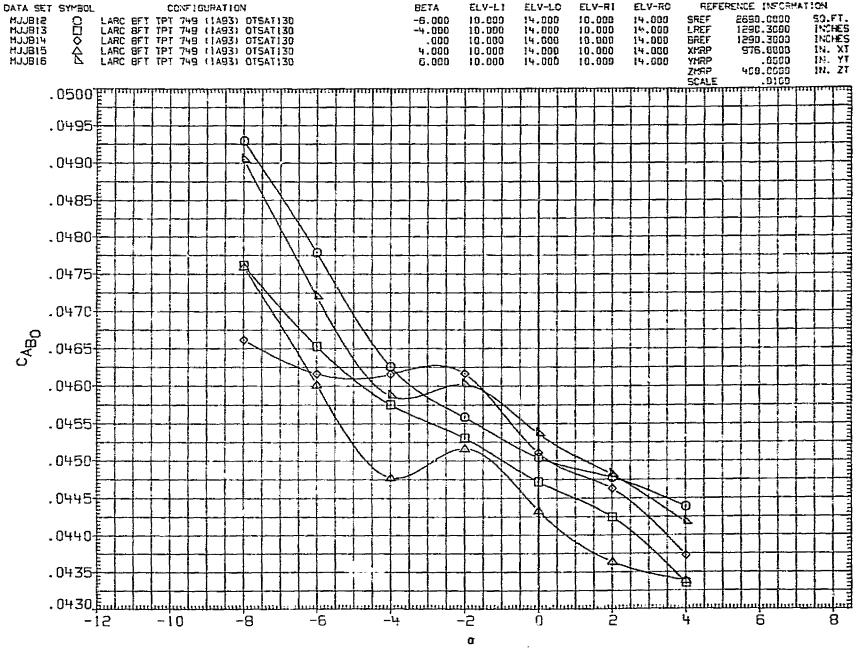


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

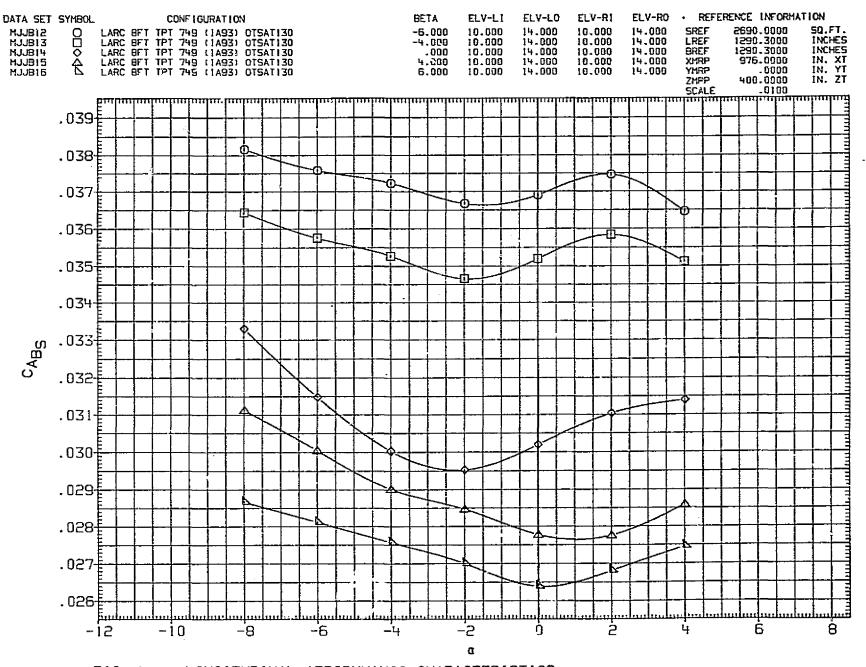


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

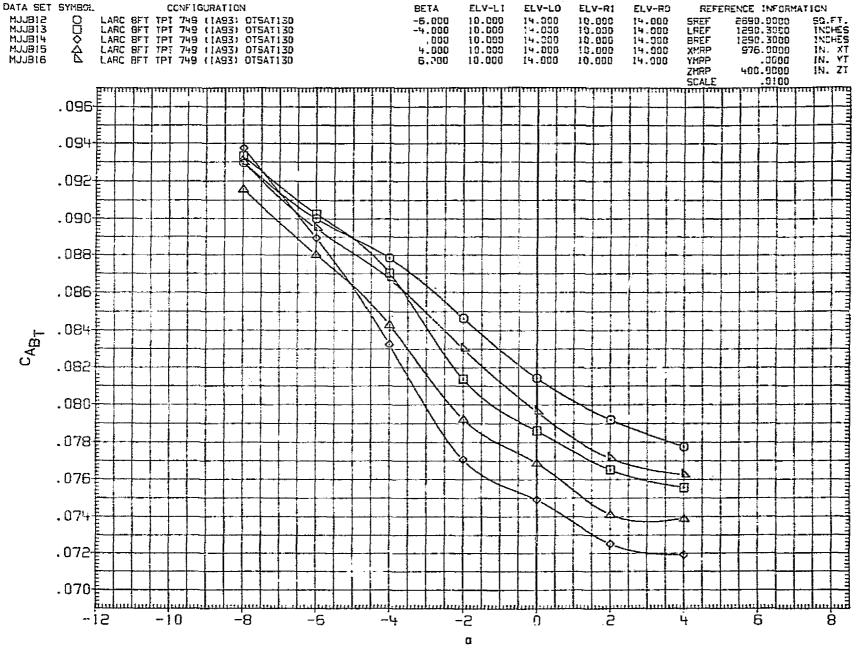


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(A)MACH = .90

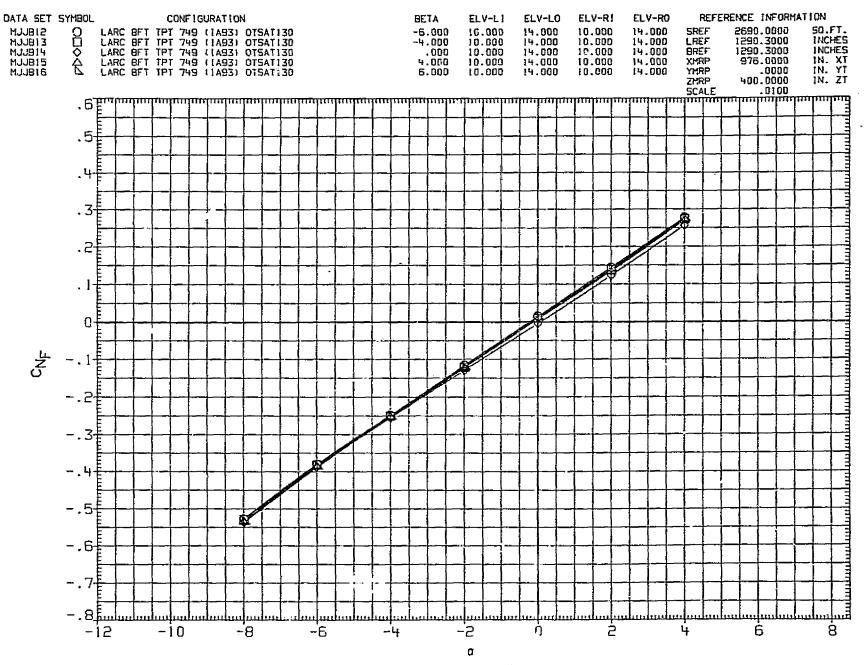


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

PAGE

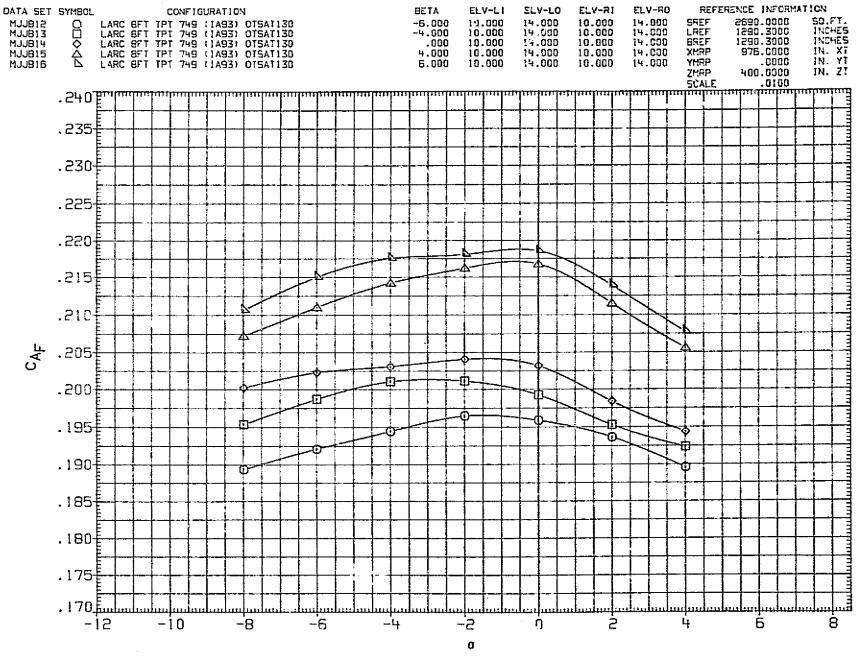
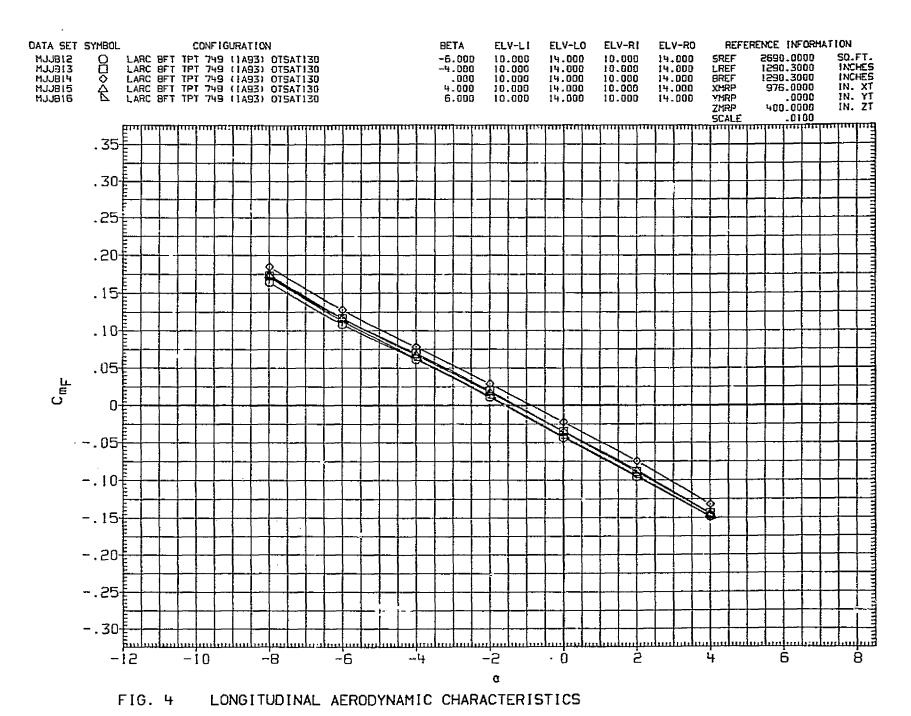


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



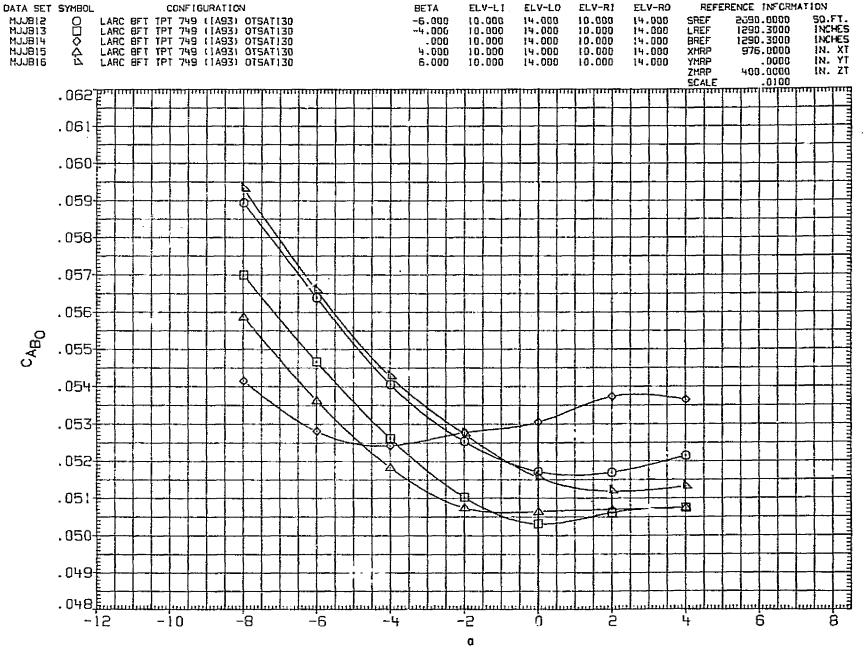
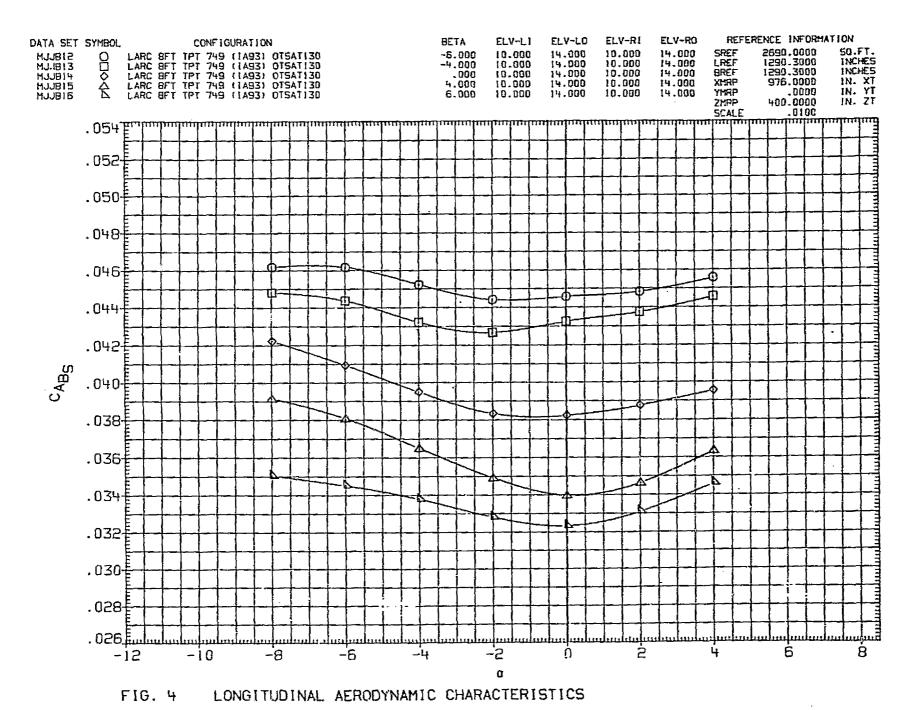


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



PAGE

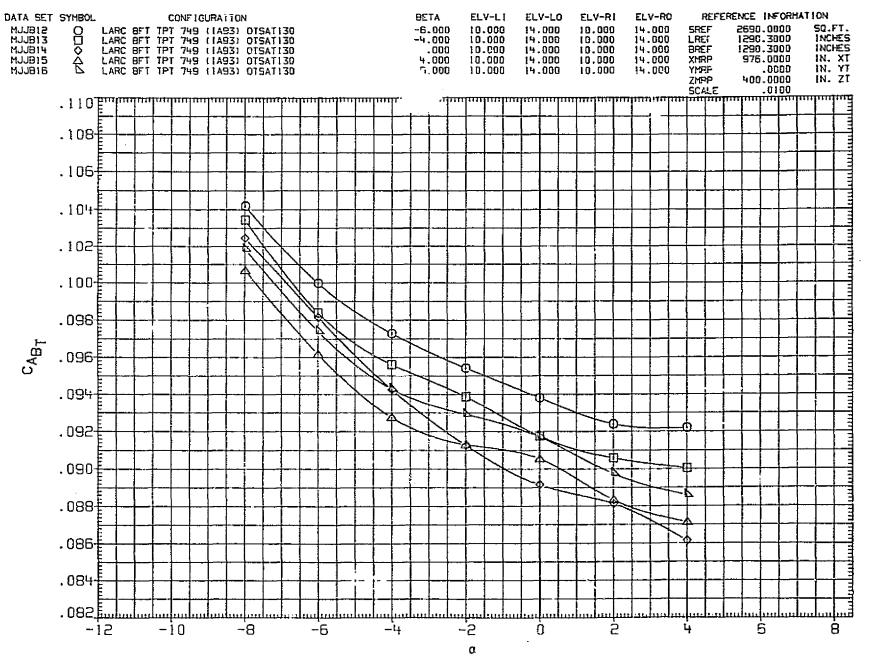
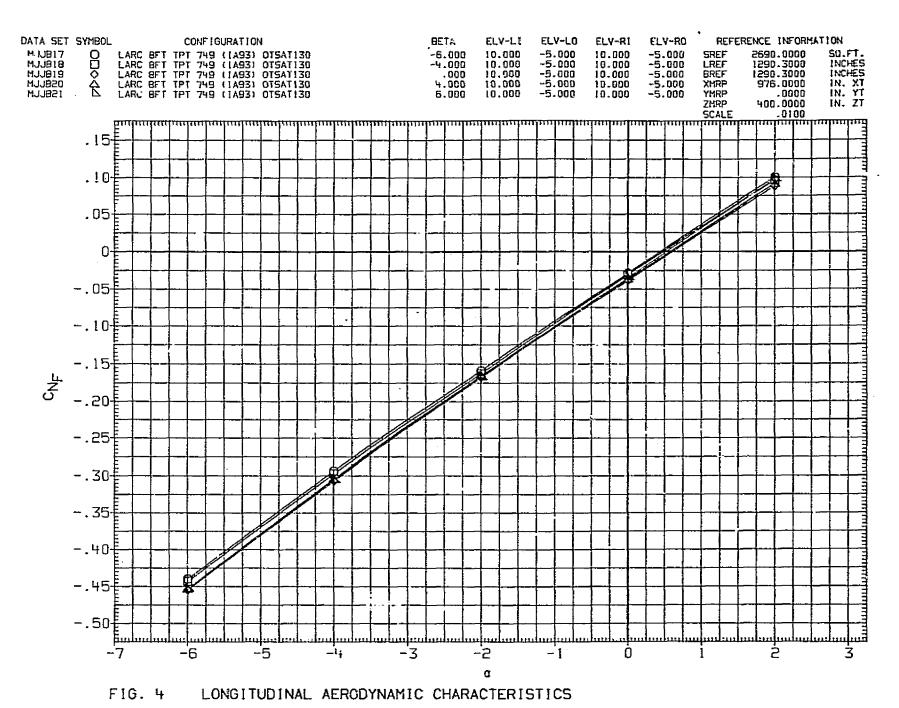


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



(A) MACH = 1.15PAGE 61

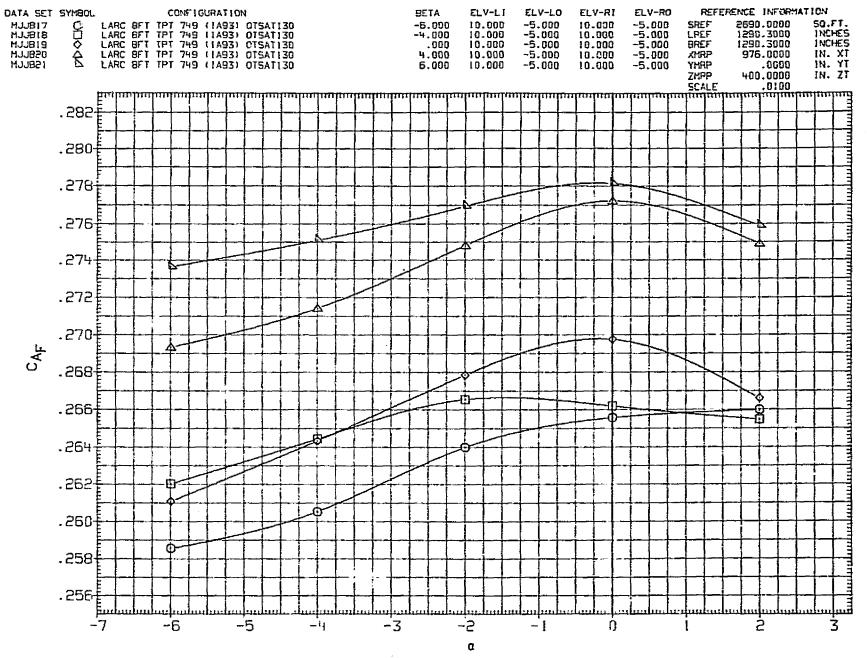


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(A) MACH = 1.15PAGE 62

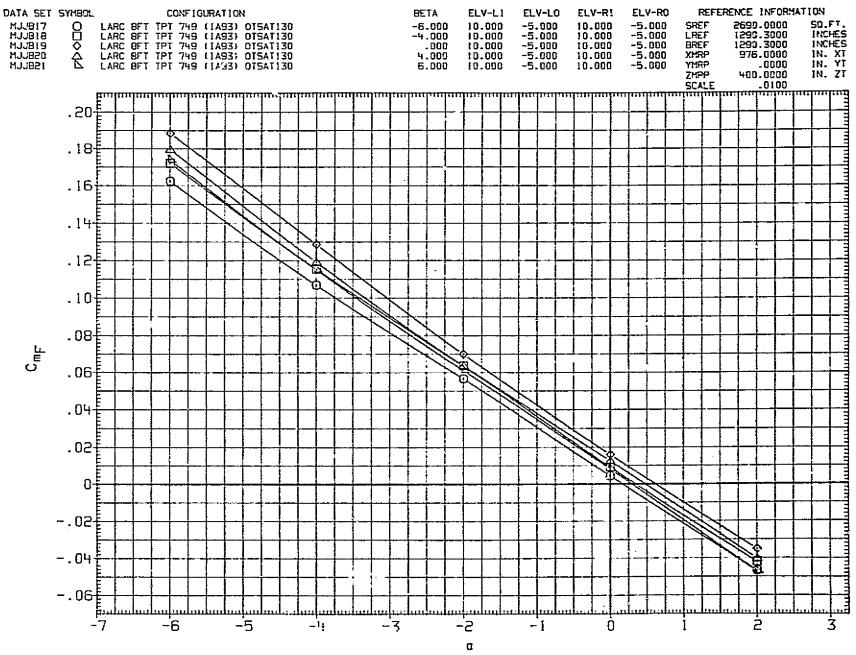


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

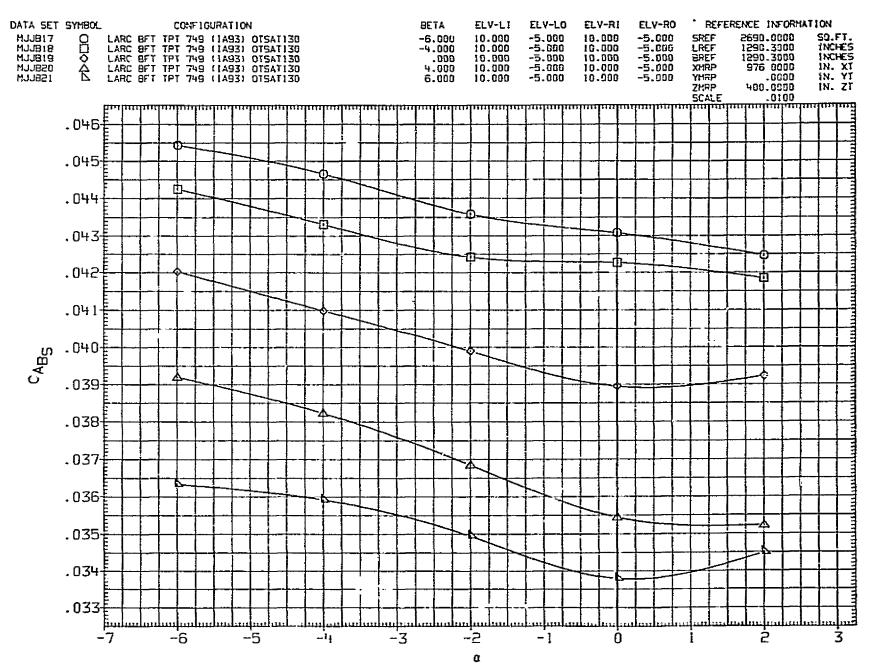


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

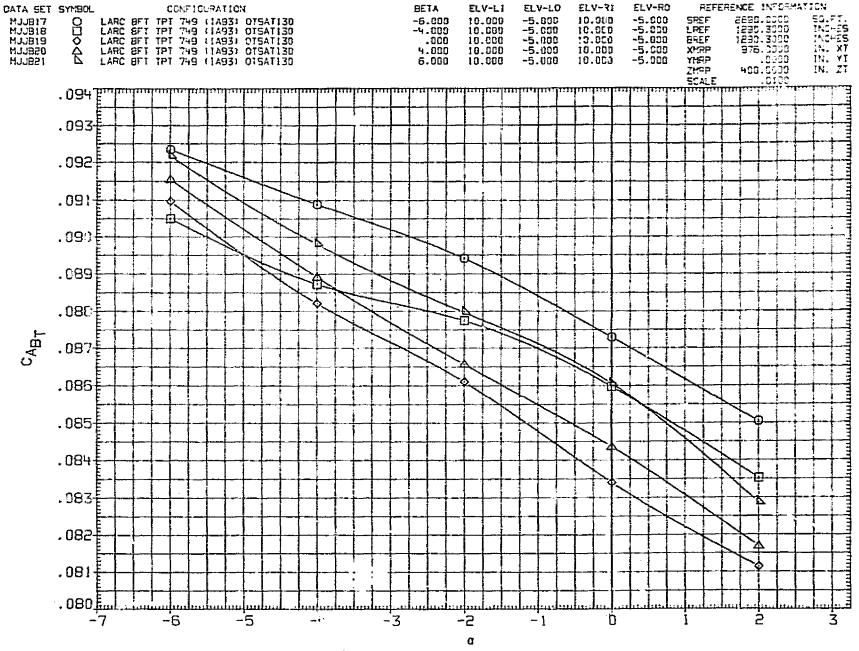


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(2) MACH \approx 1.20 PAGE 67

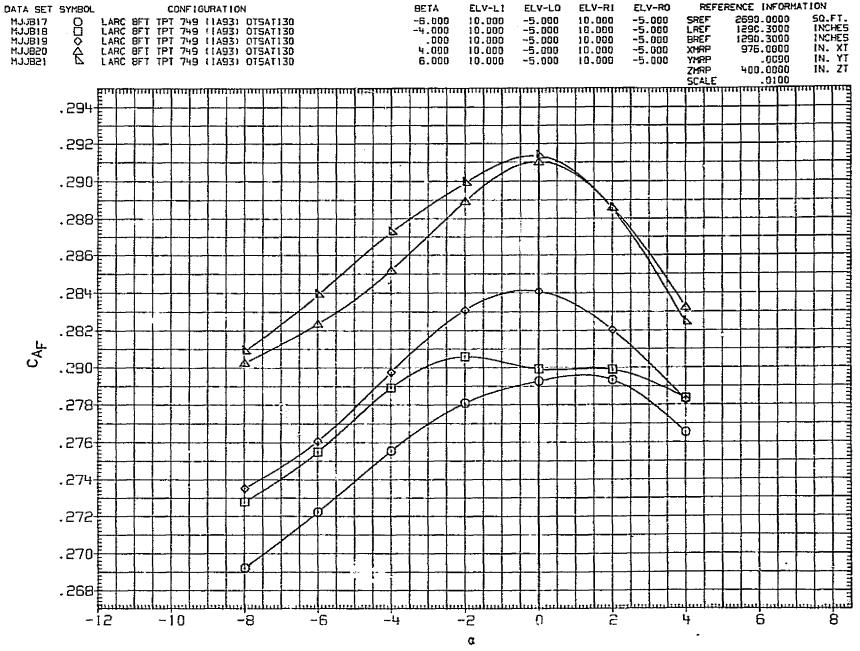


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

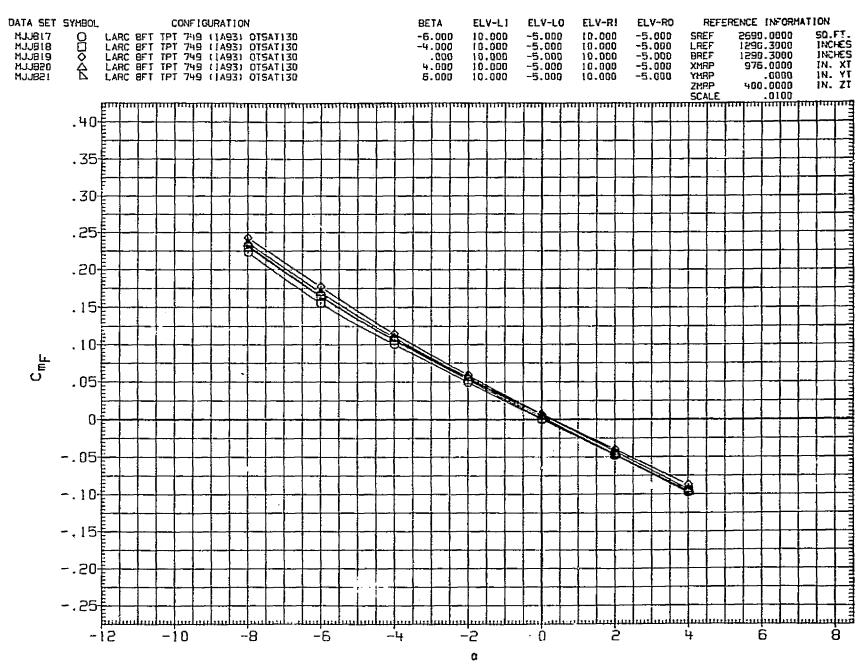


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

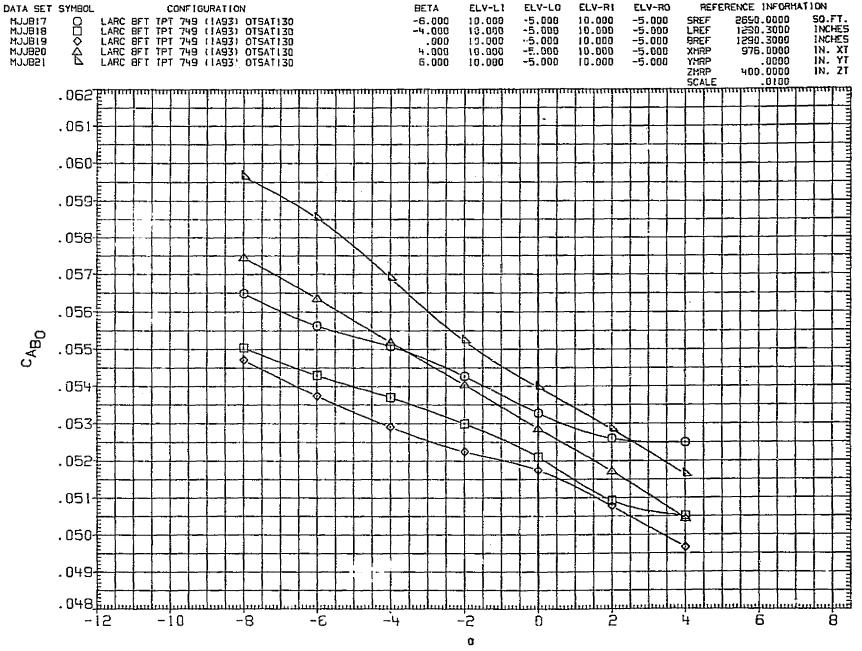


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

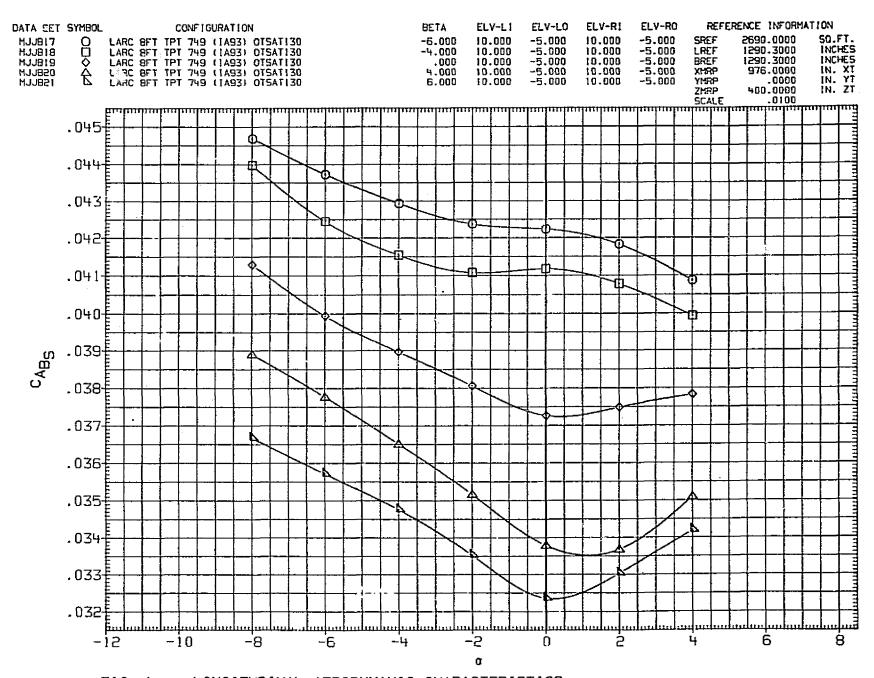


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B) MACH = 1.20 PAGE 71

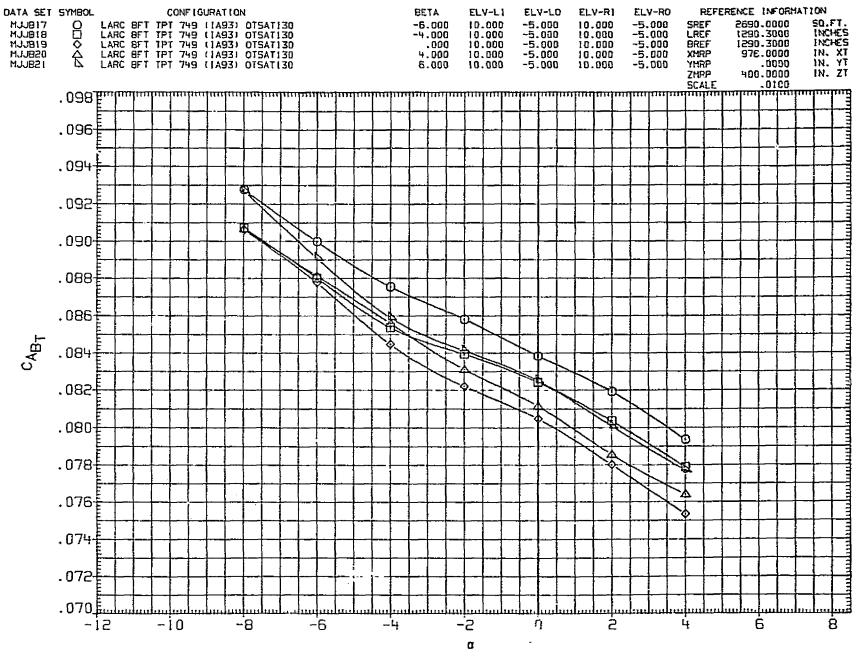


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B) MACH = 1.20 PAGE 72

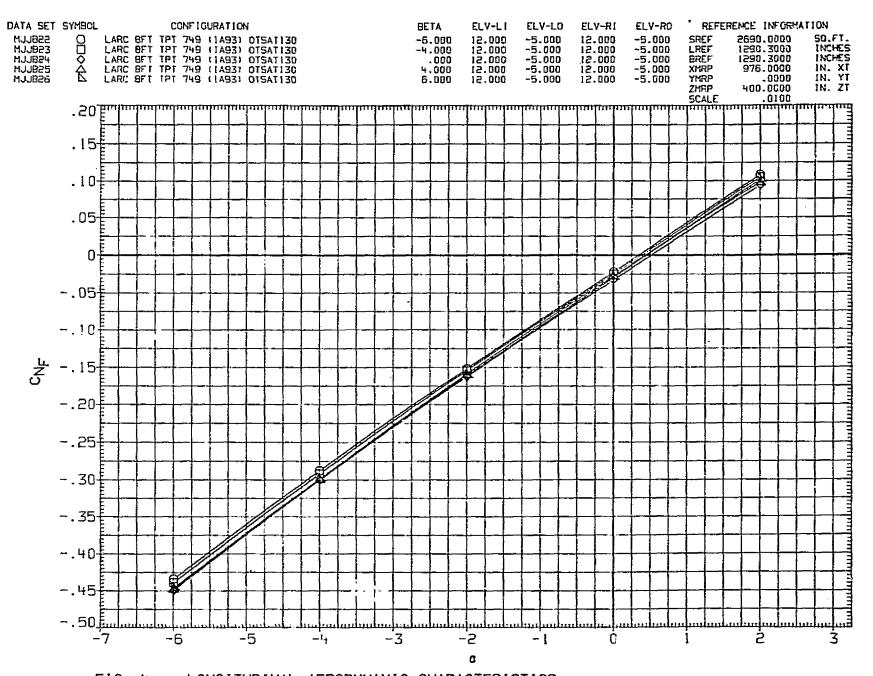
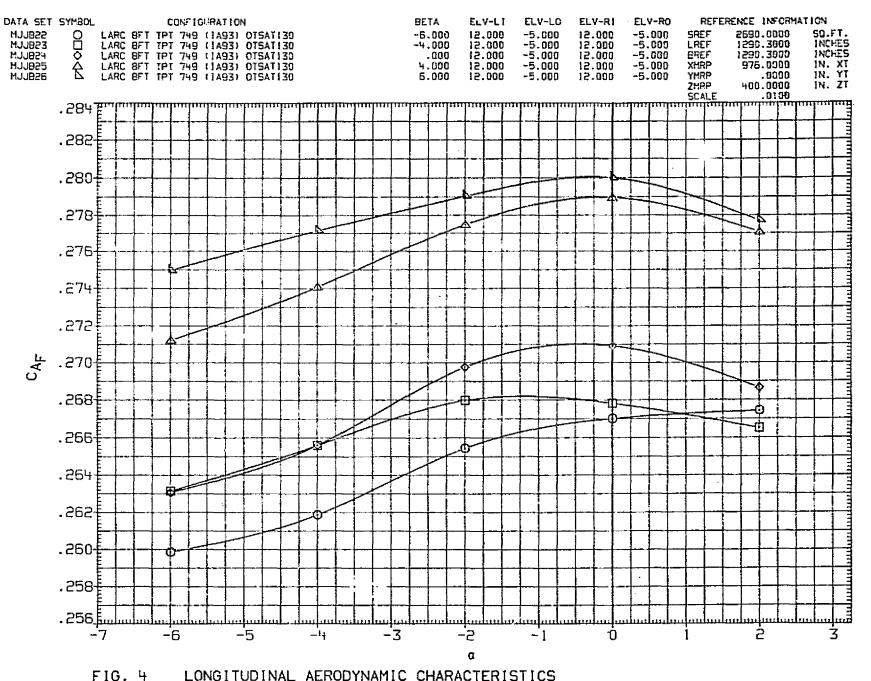


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



(A)MACH = 1.15 PAGE

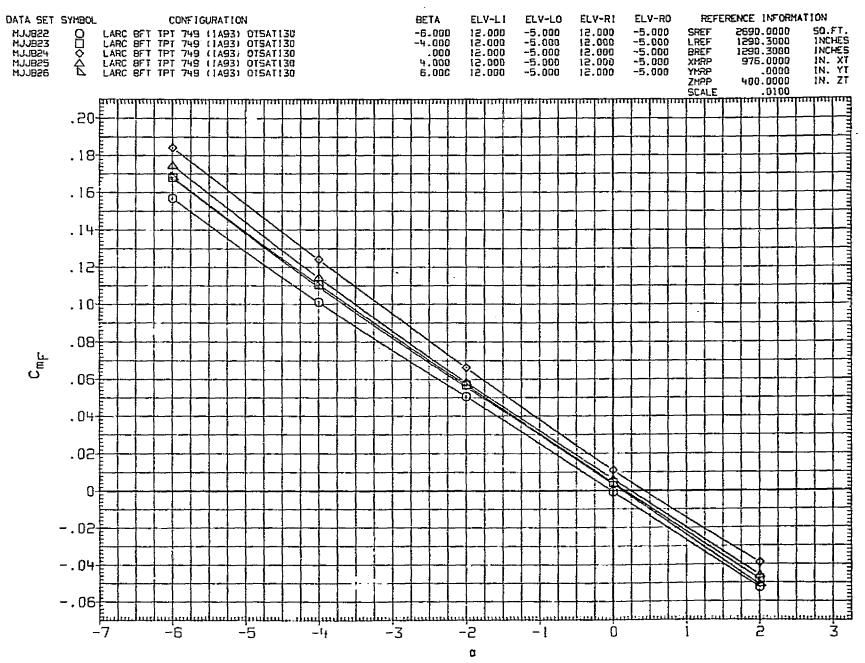


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

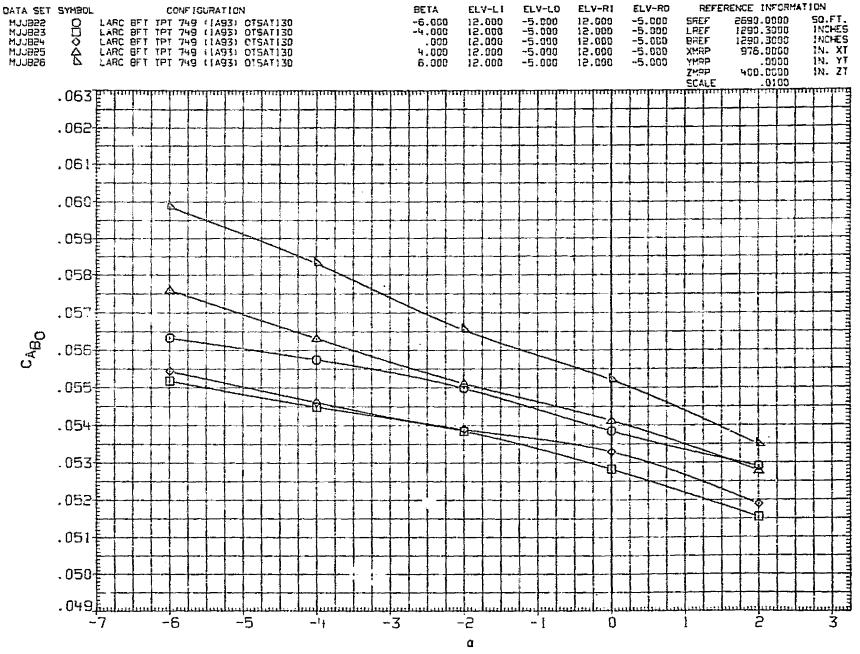


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

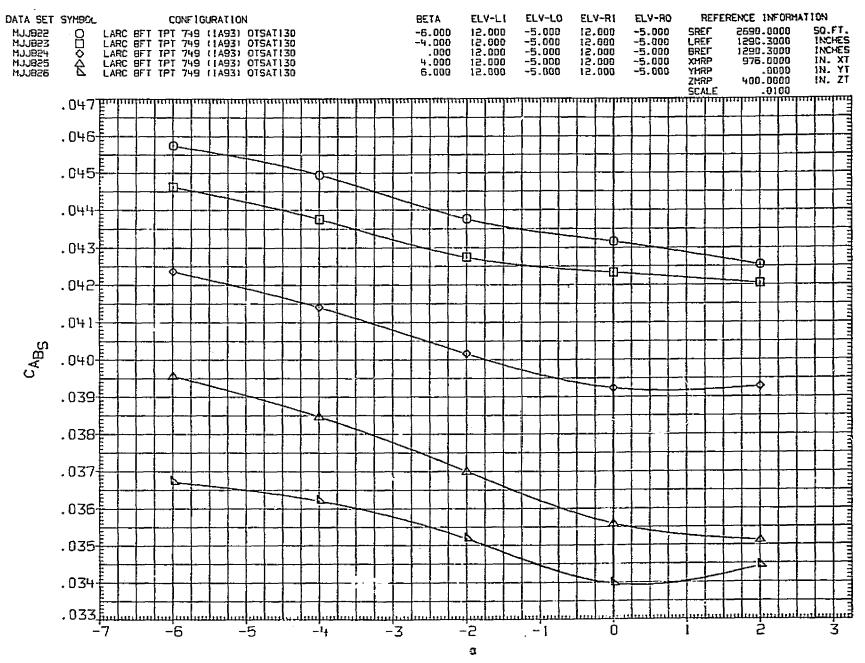


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

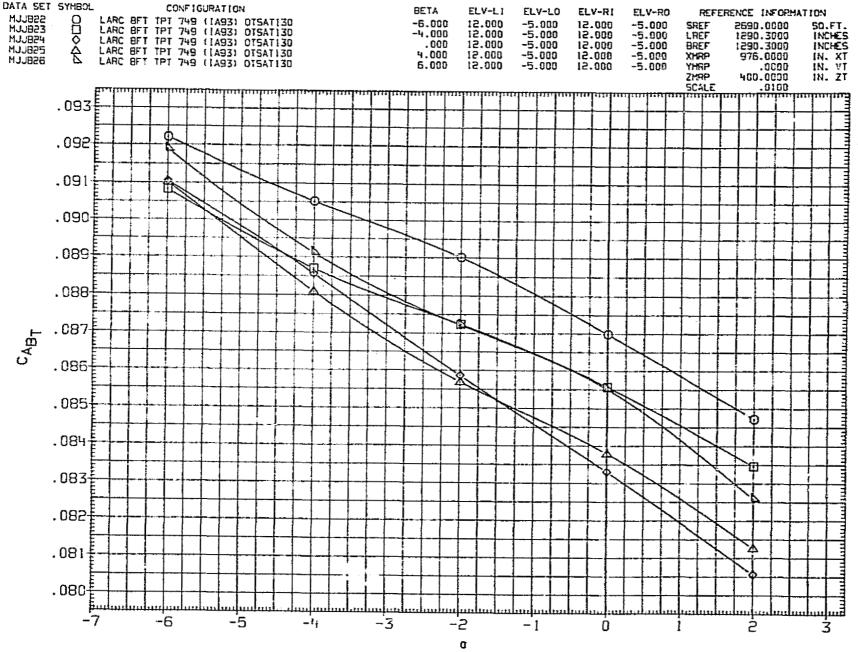


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

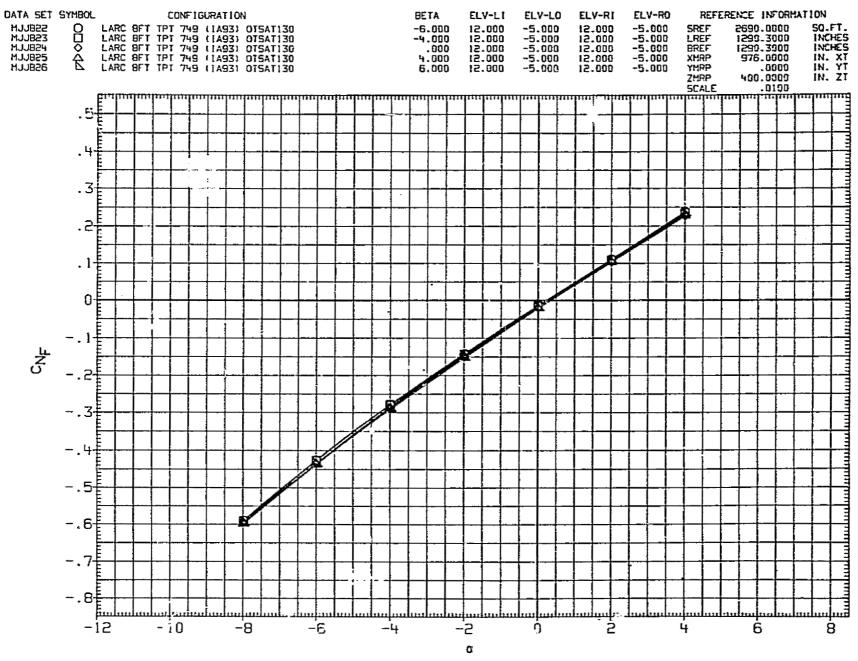


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

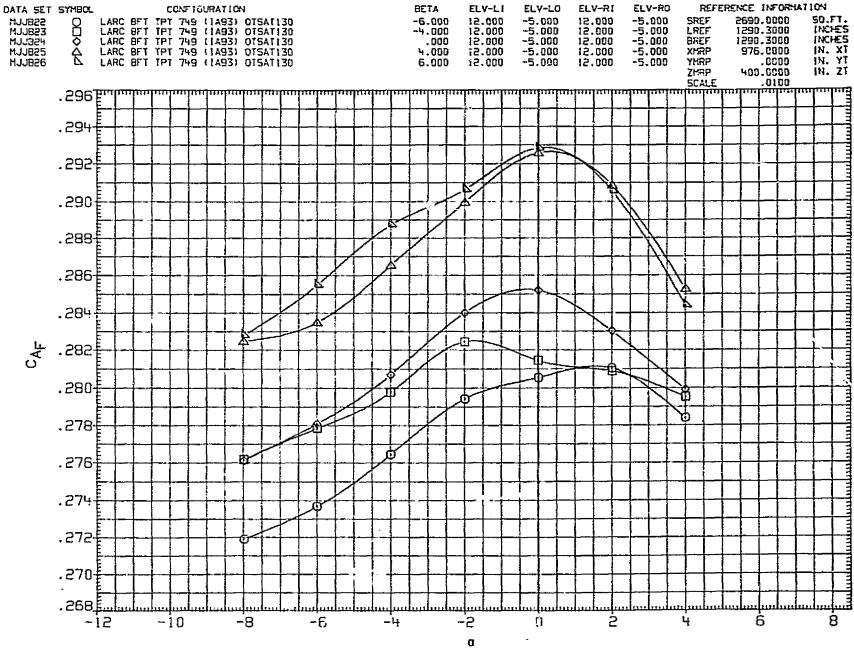


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

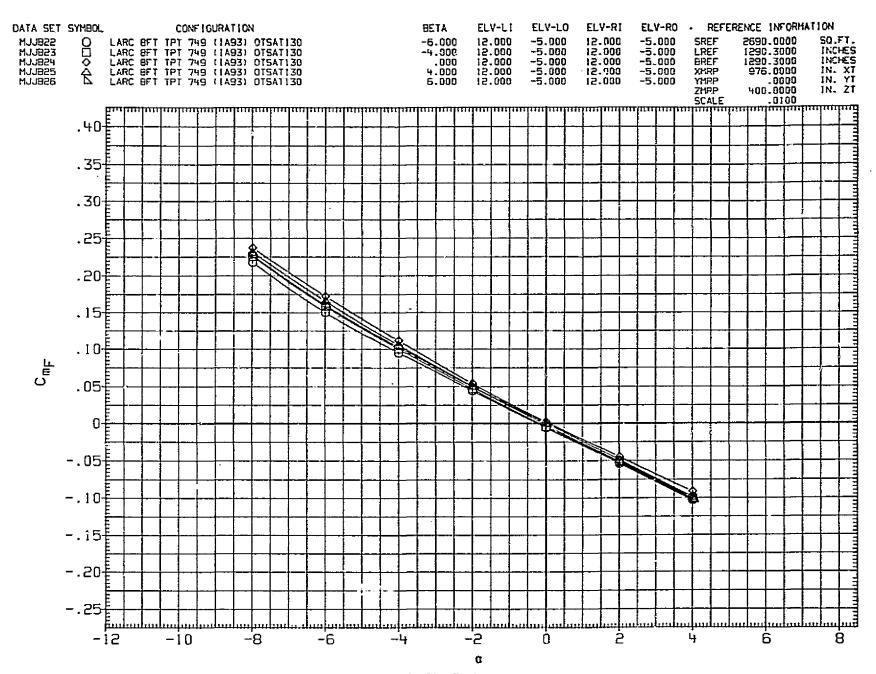


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

PAGE

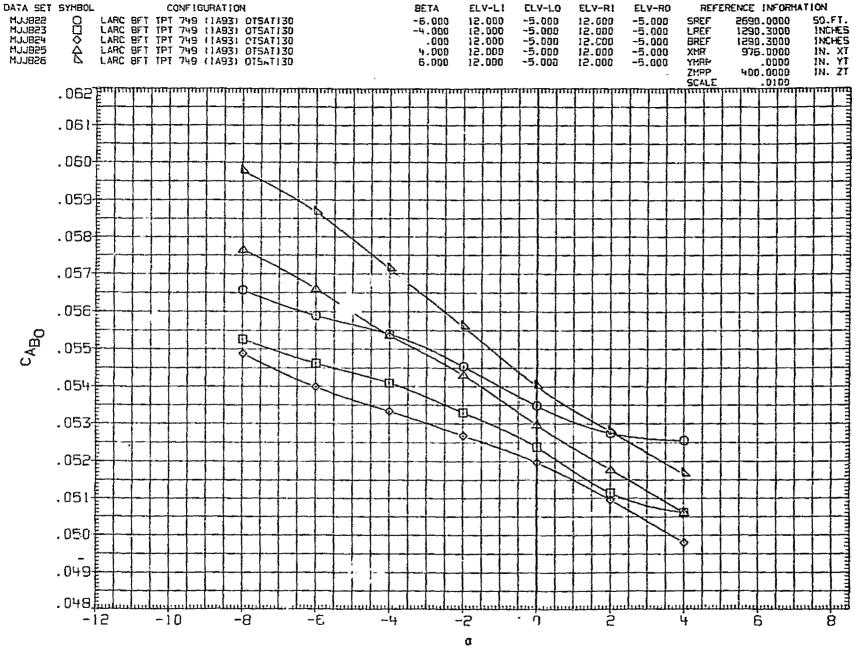


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

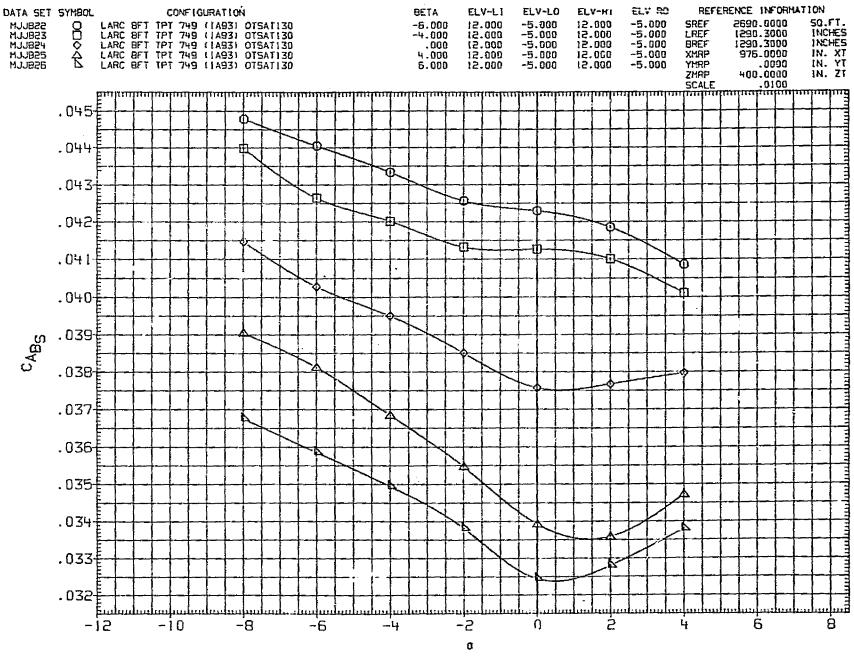


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

PAGE 83

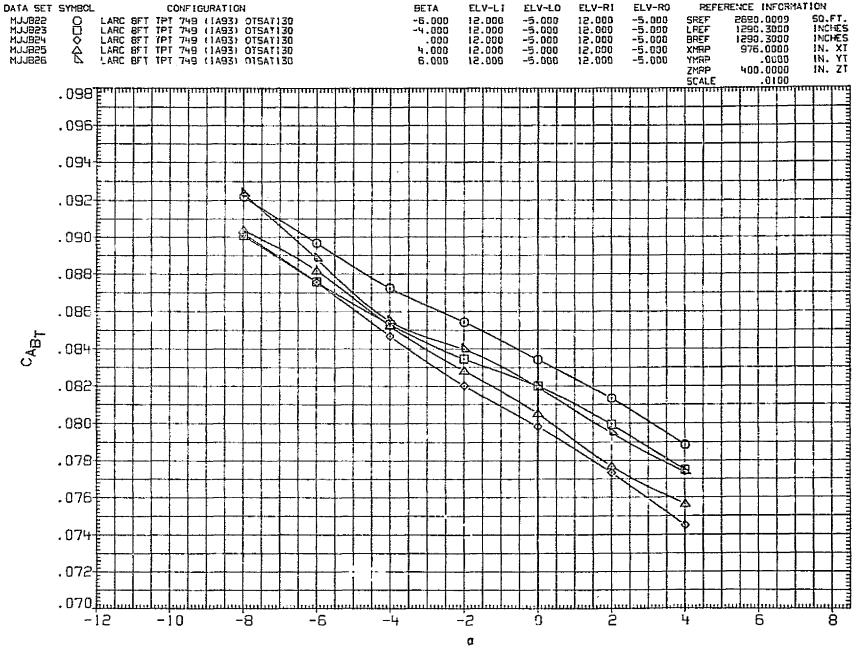


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

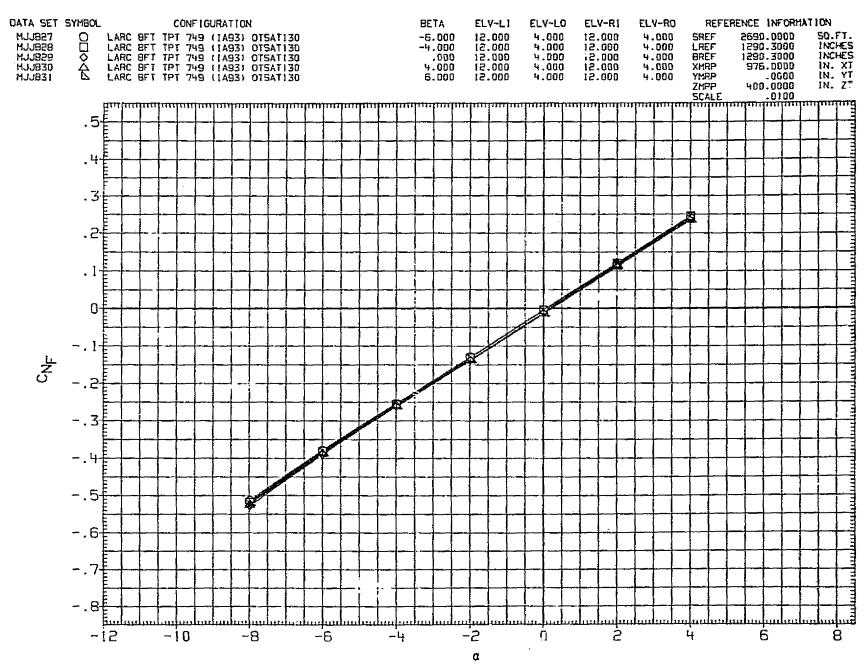


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

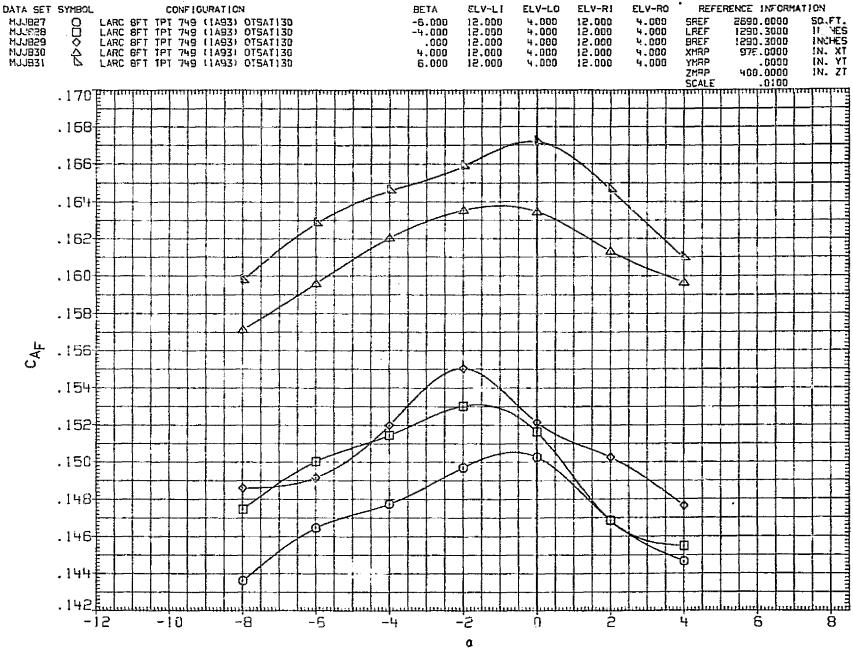


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

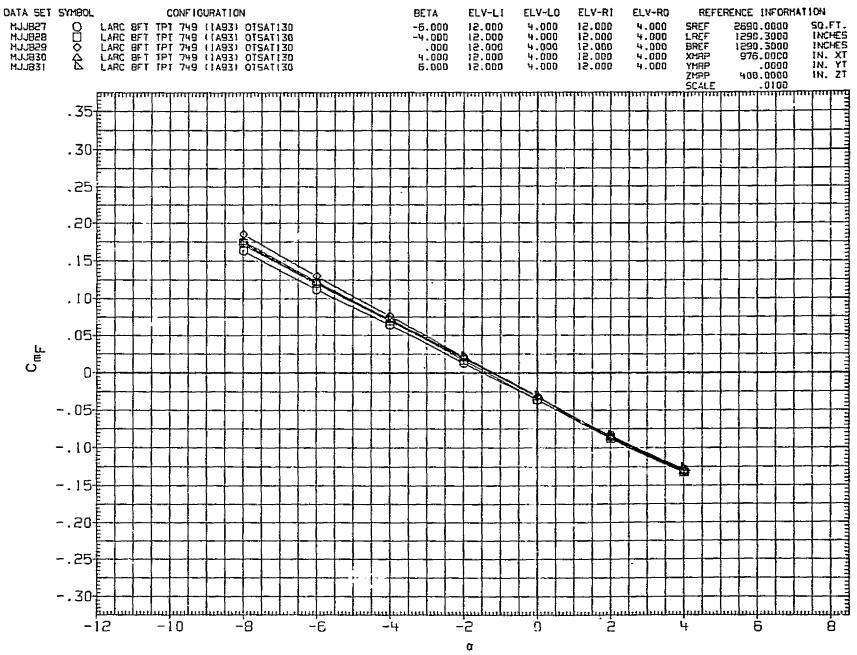


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

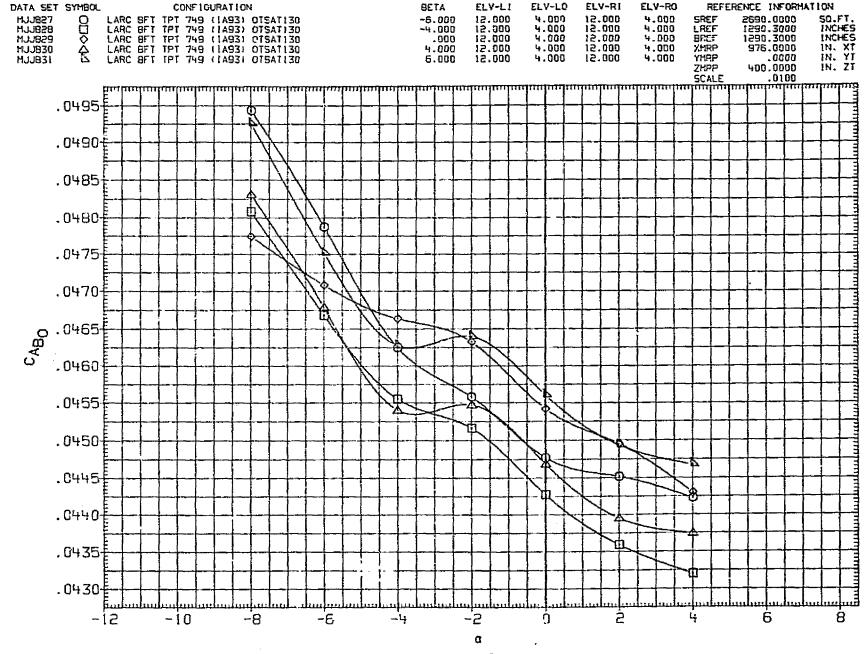


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(A)MACH = .90 PAGE 88

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

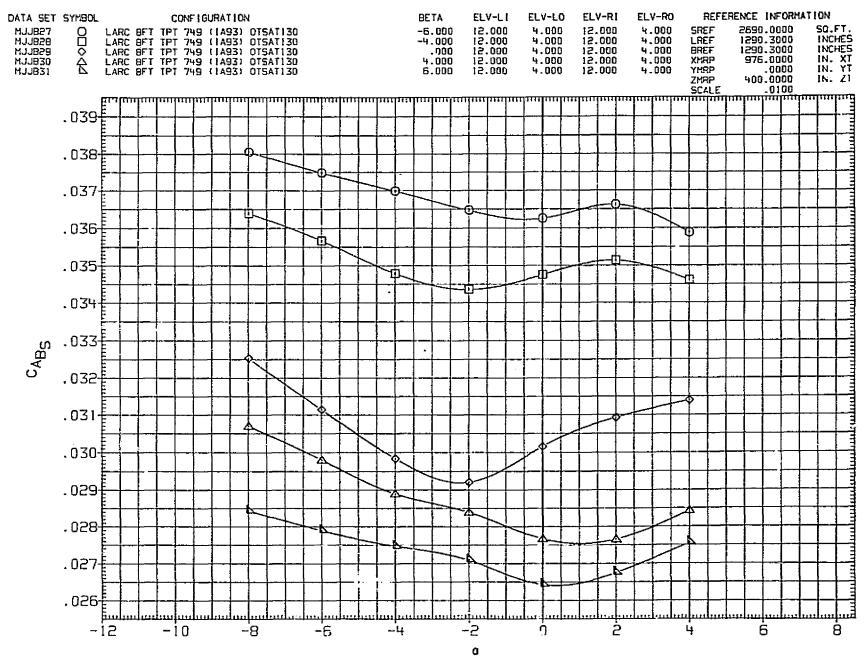


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

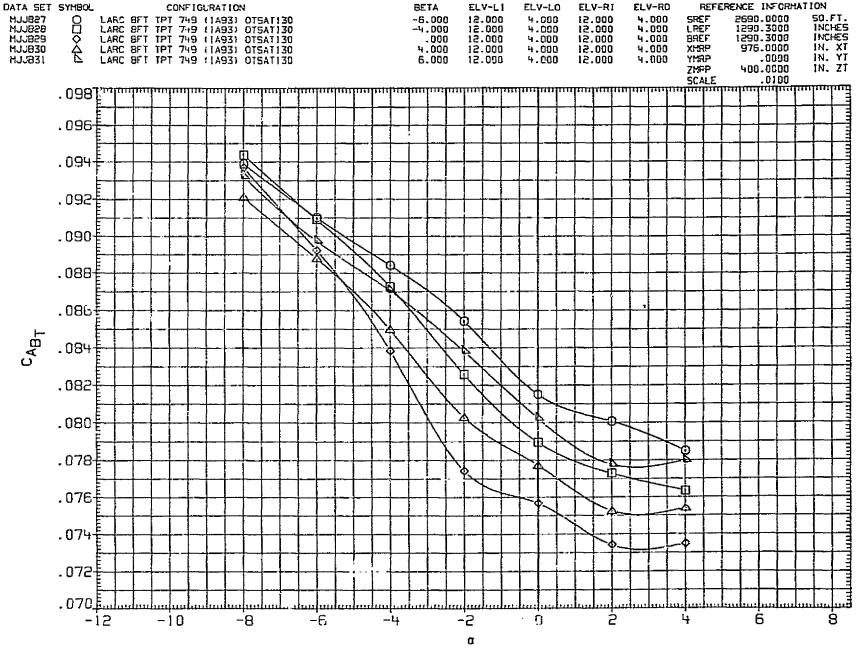


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

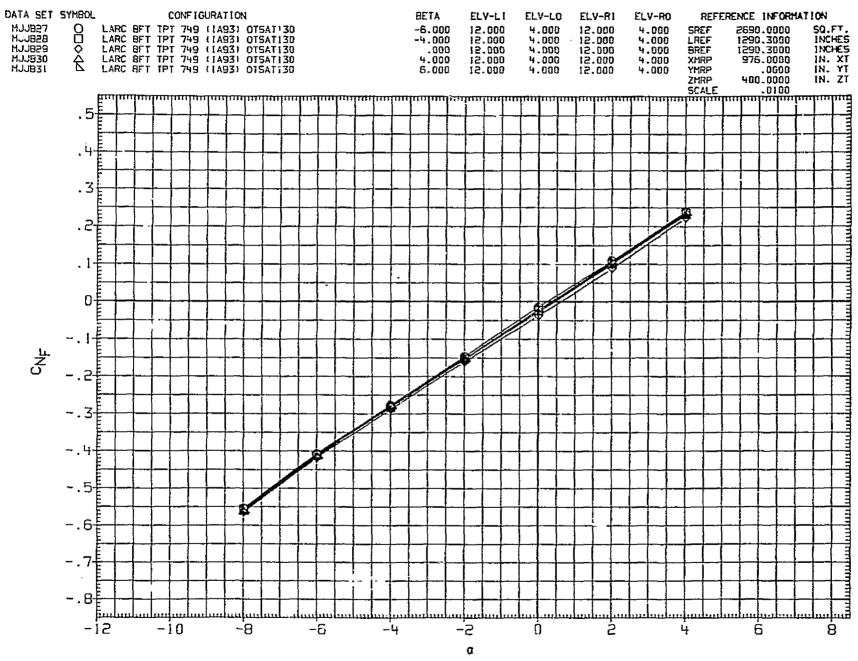


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

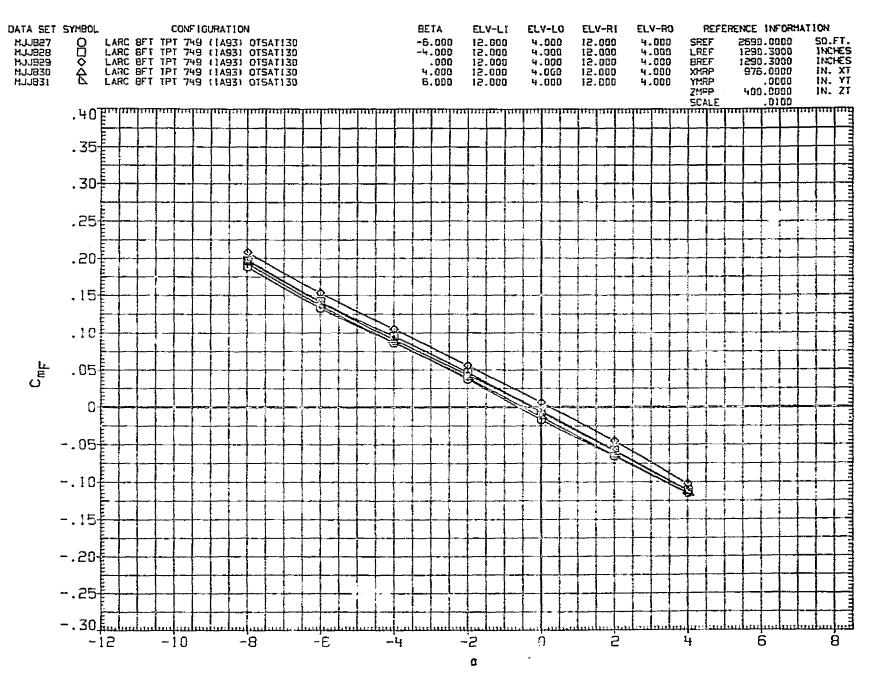


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

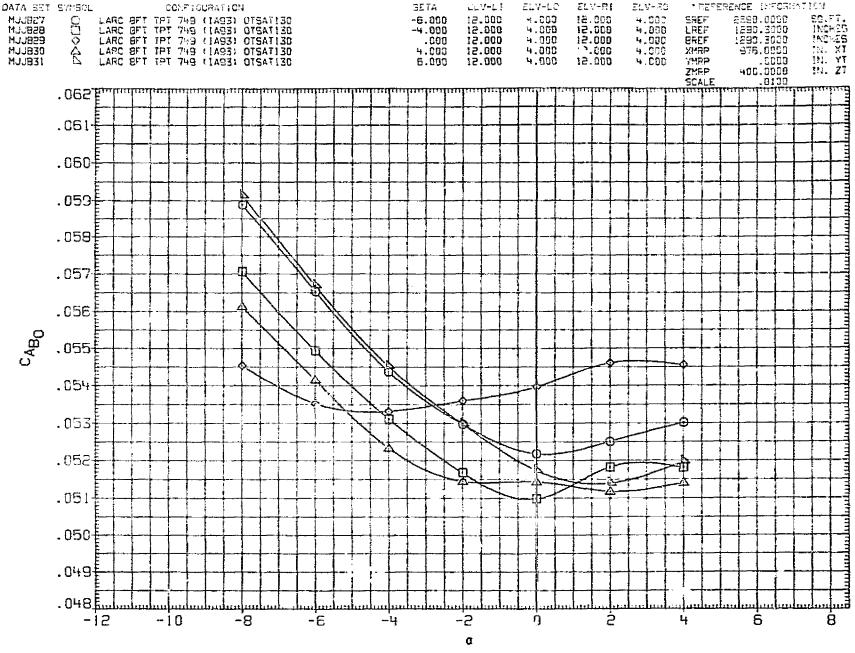


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

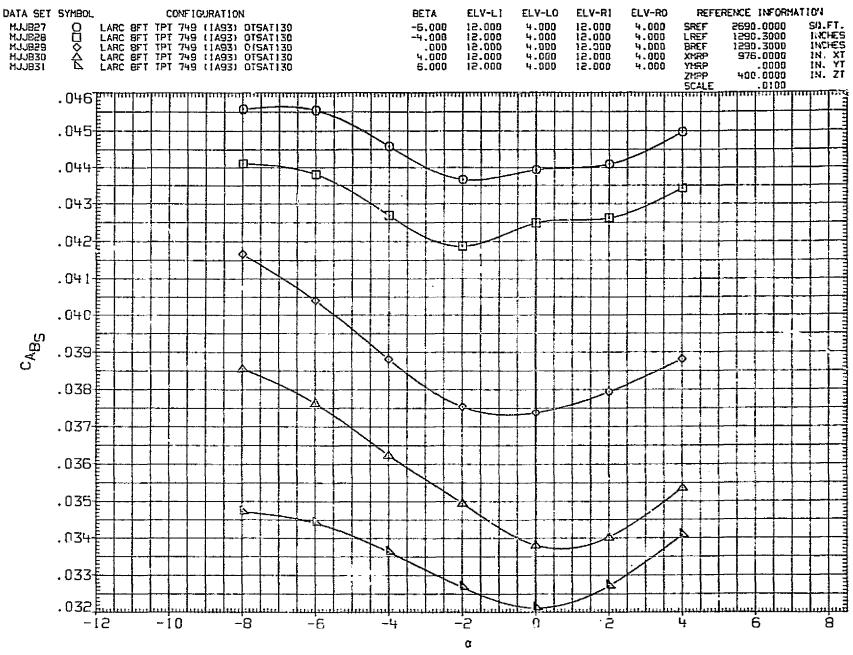


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

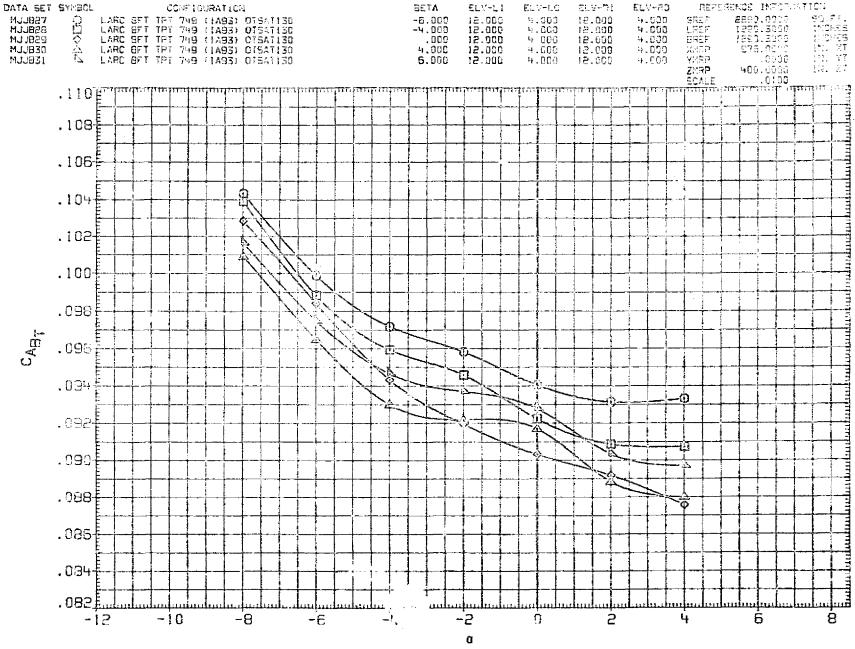


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

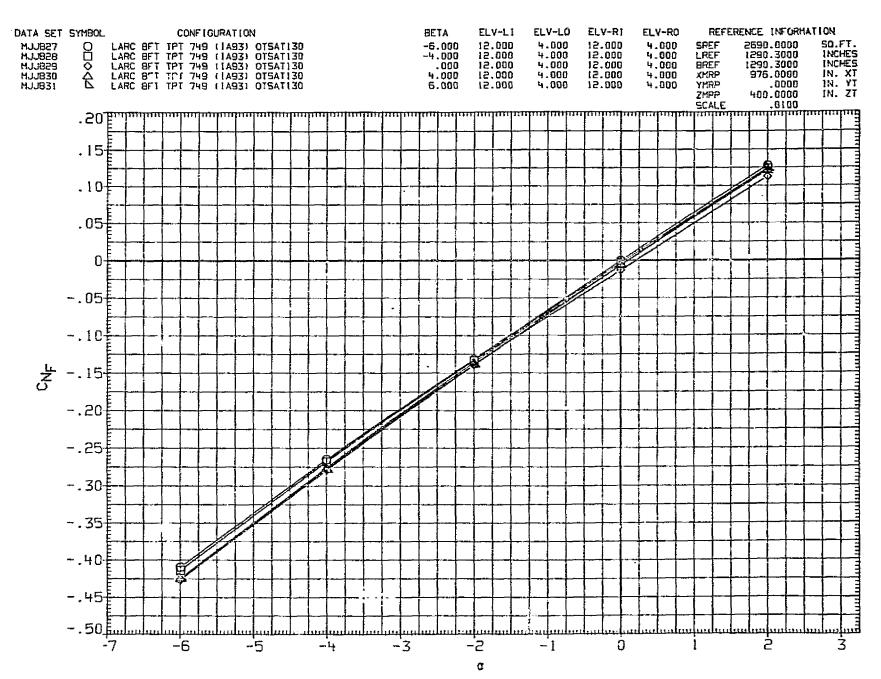
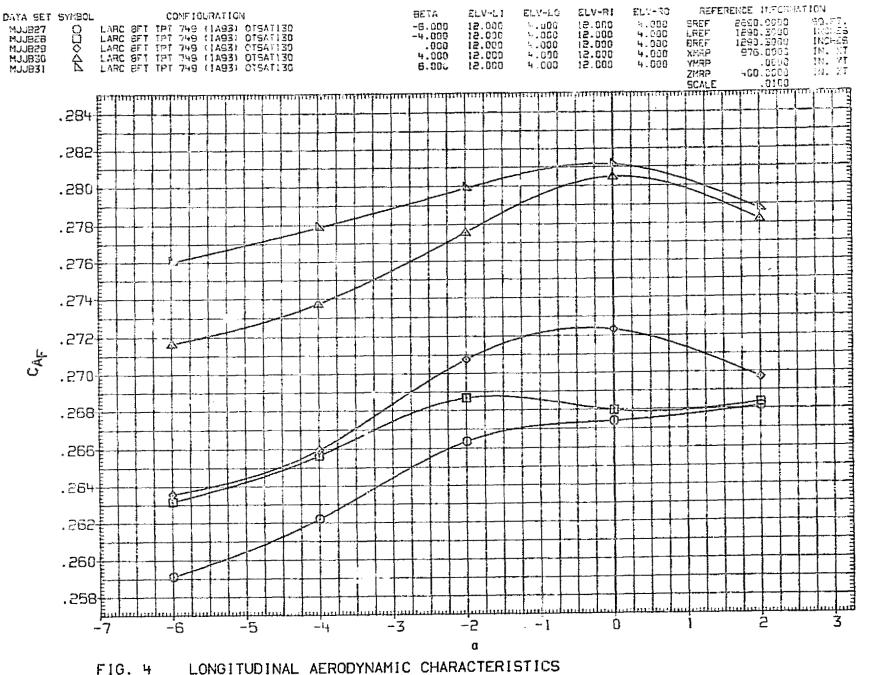


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



(C) MACH = 1.15

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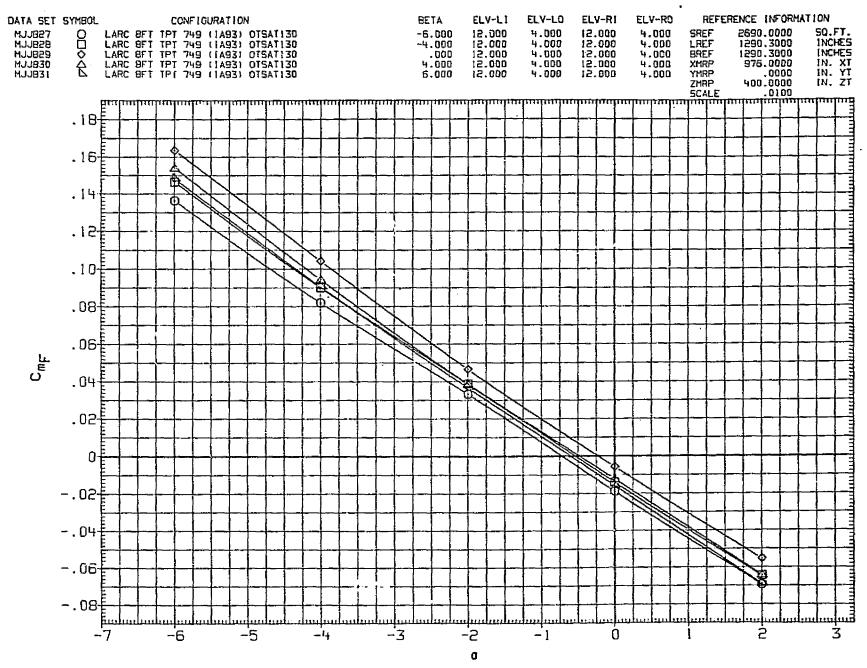


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

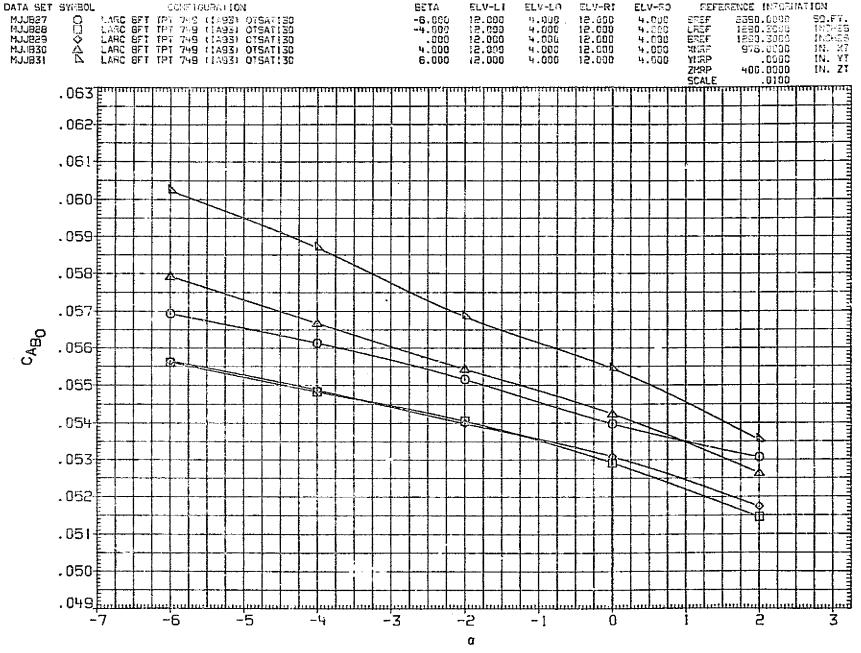


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(C)MACH = 1.15

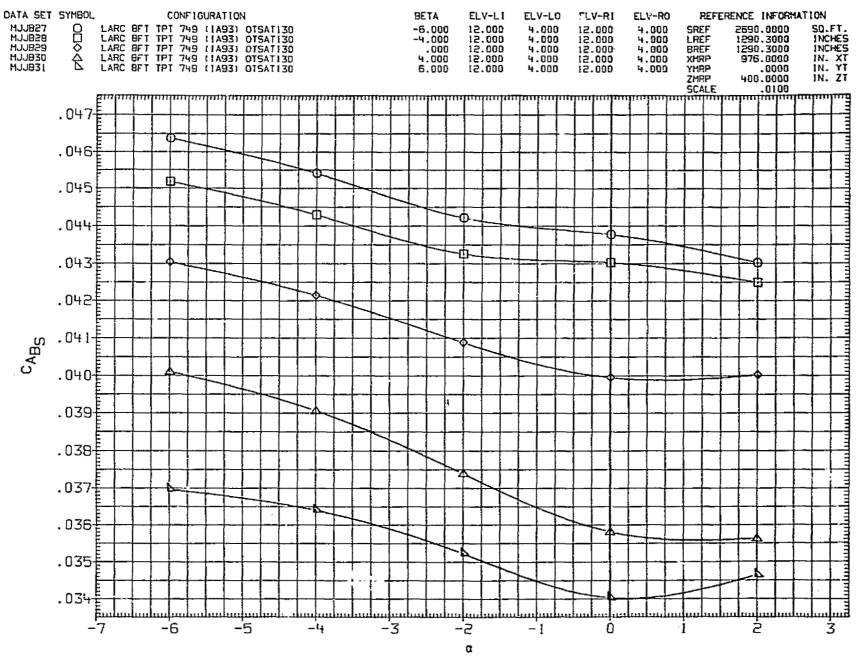


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

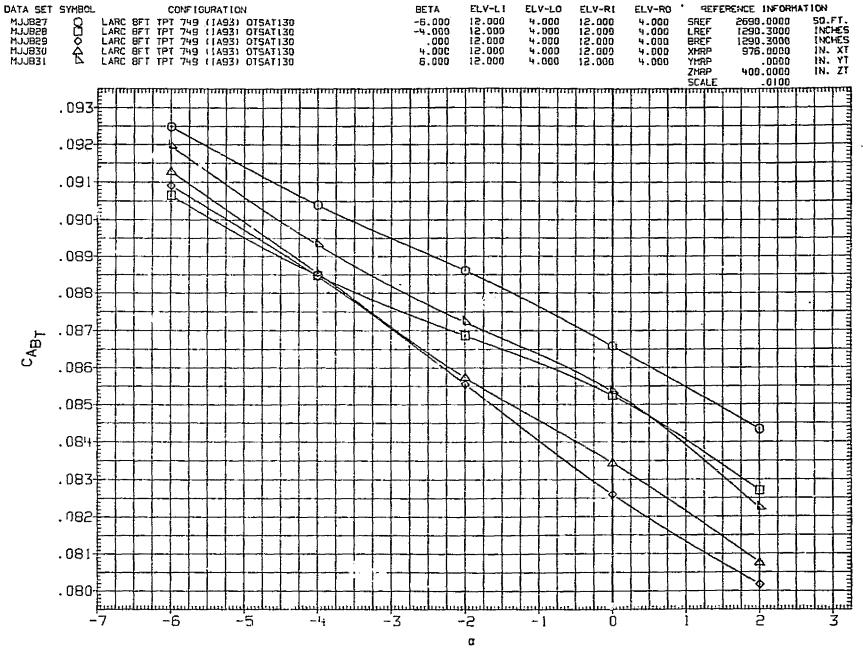


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

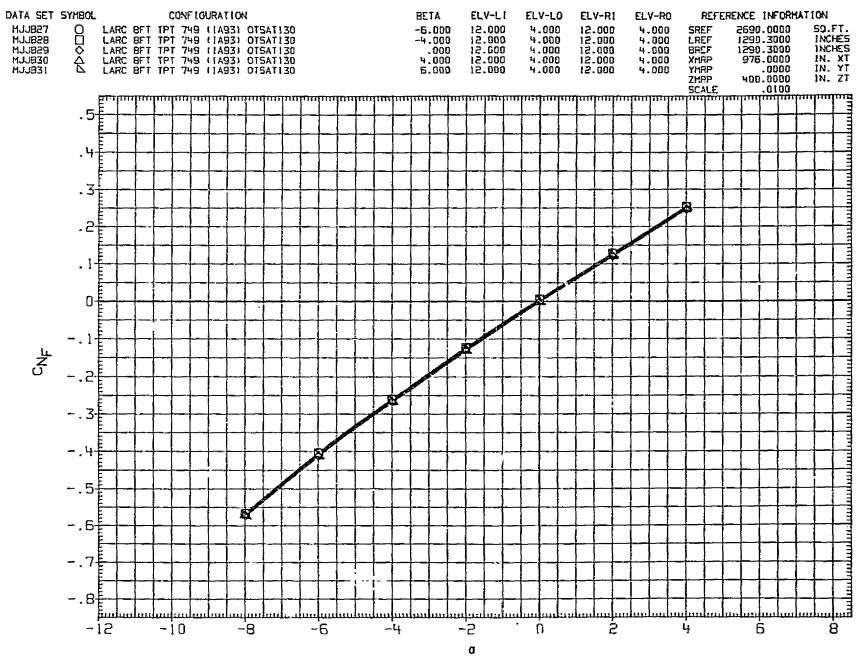


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D) MACH = 1.20 PAGE 103



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20

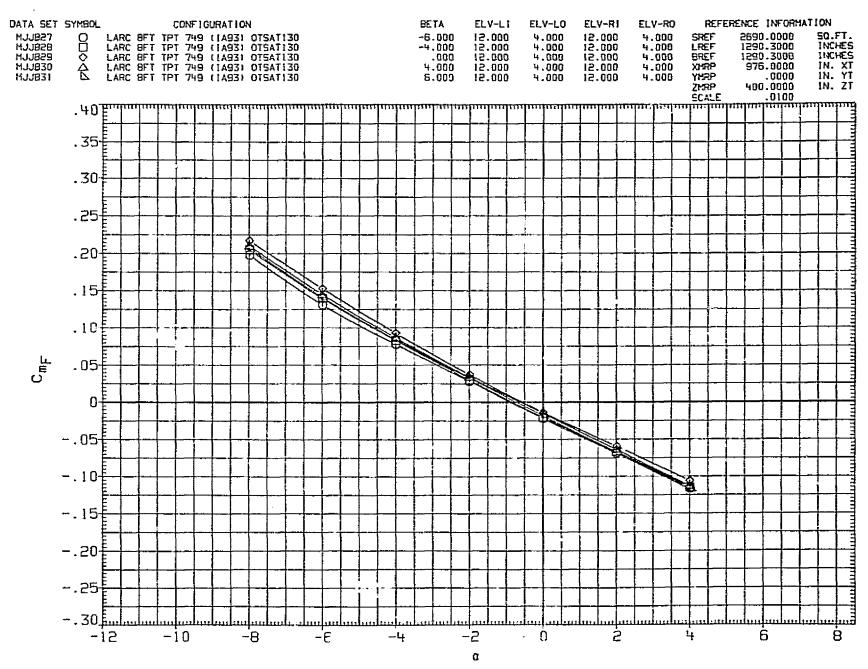


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

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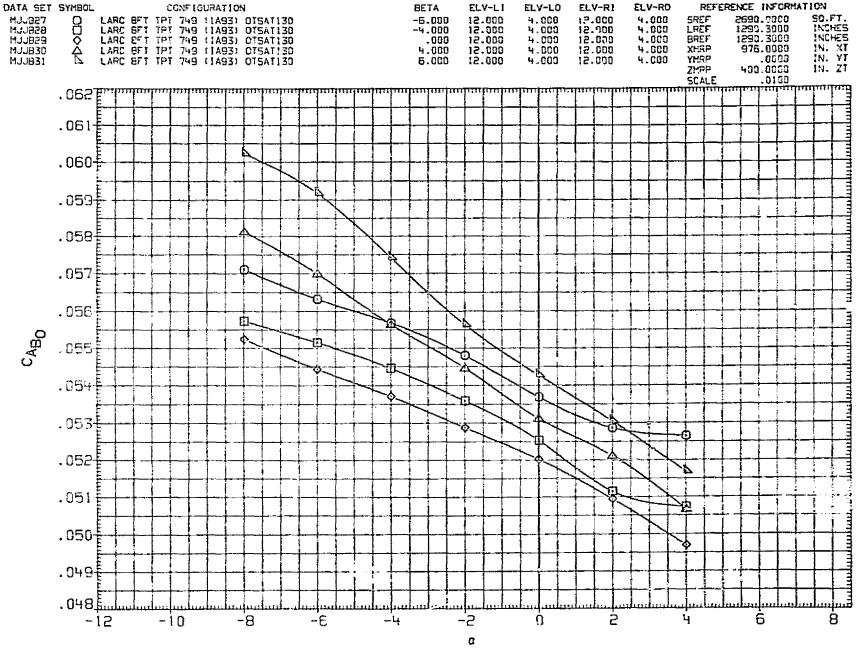


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

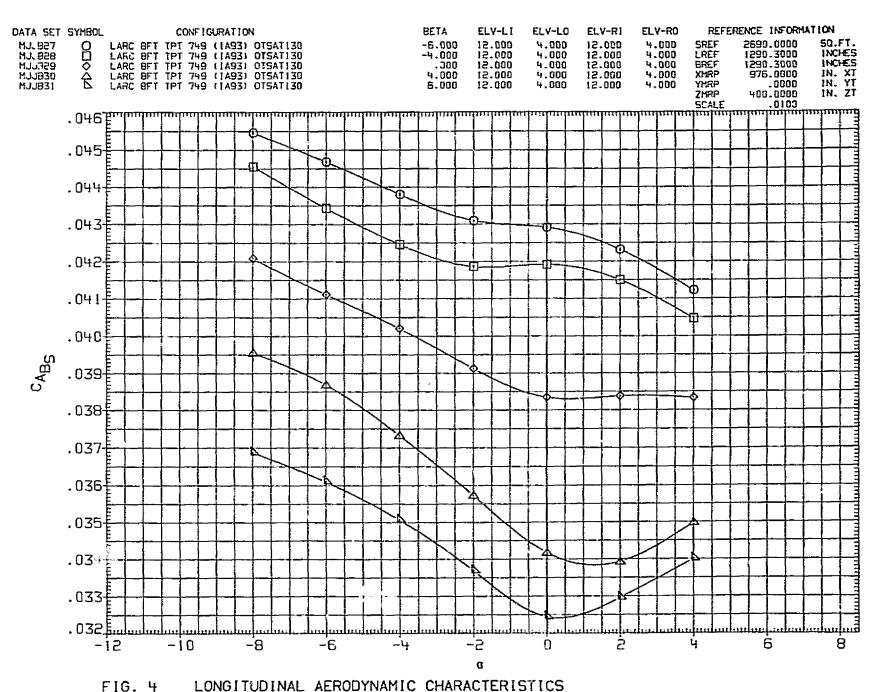


FIG. 4 CONDITIONINAL MERODINANTE CHARACTERISTICS

(D) MACH = 1.20 PAGE 107

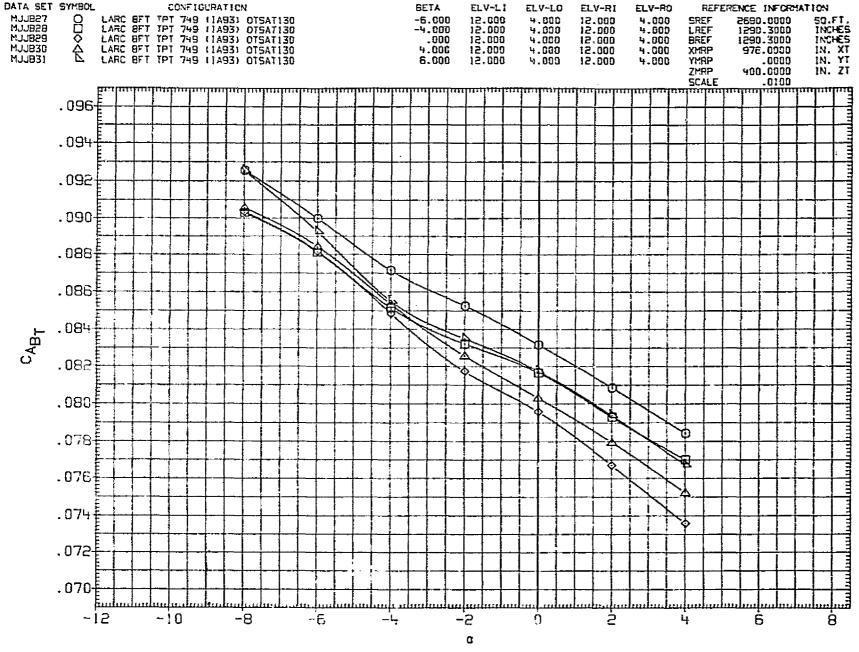


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D) MACH = 1.20 PAGE 108

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

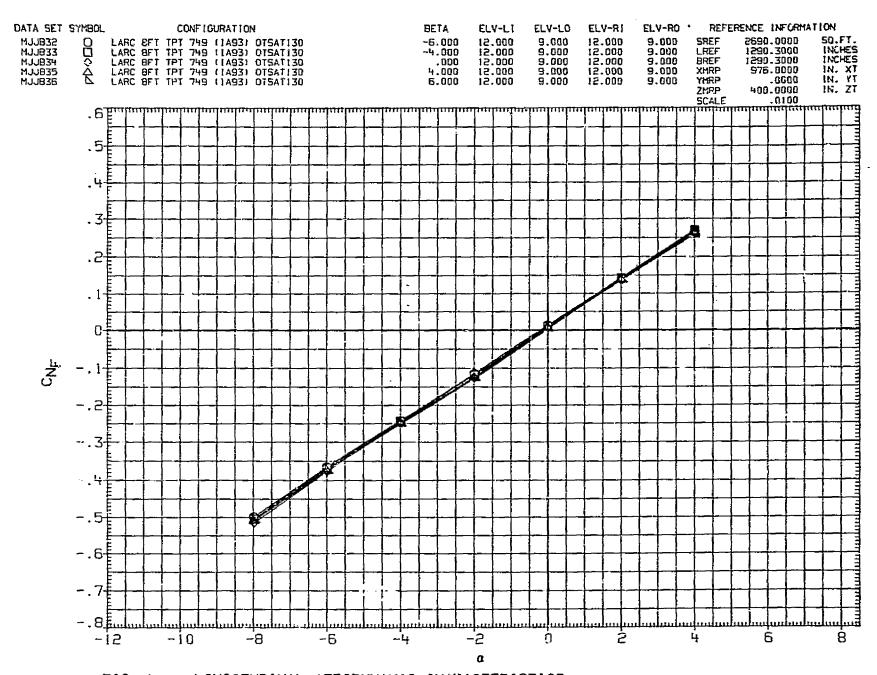


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

PAGE 109:

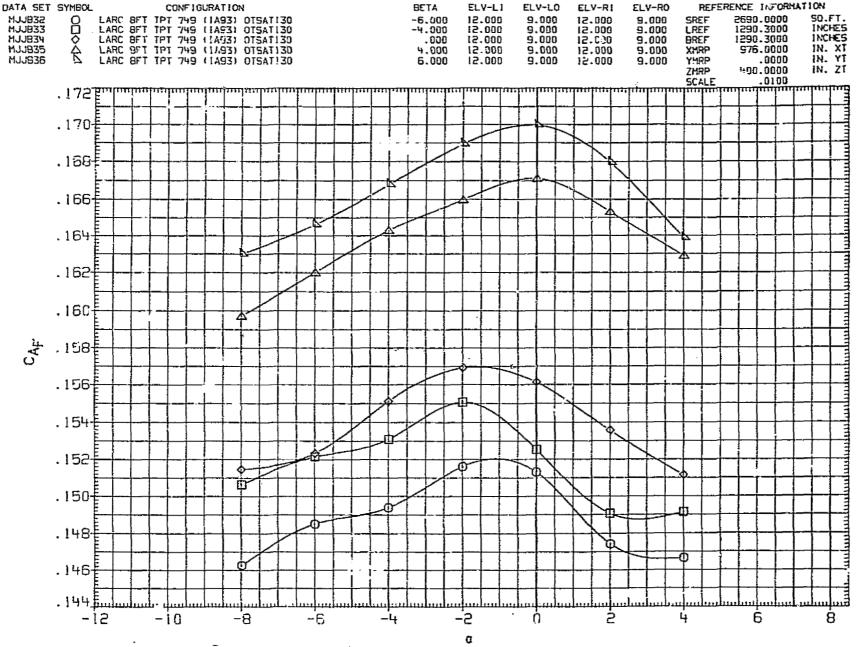


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

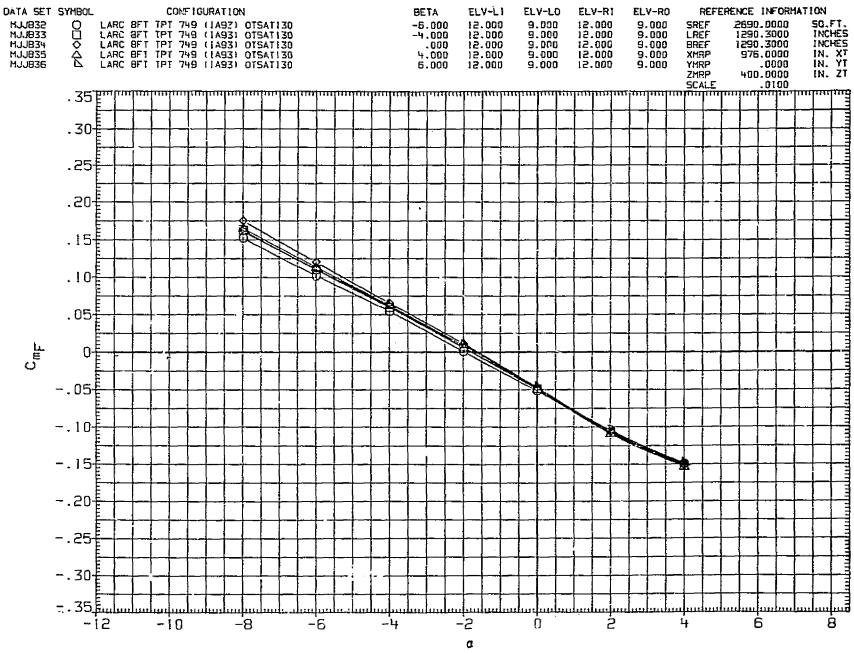


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

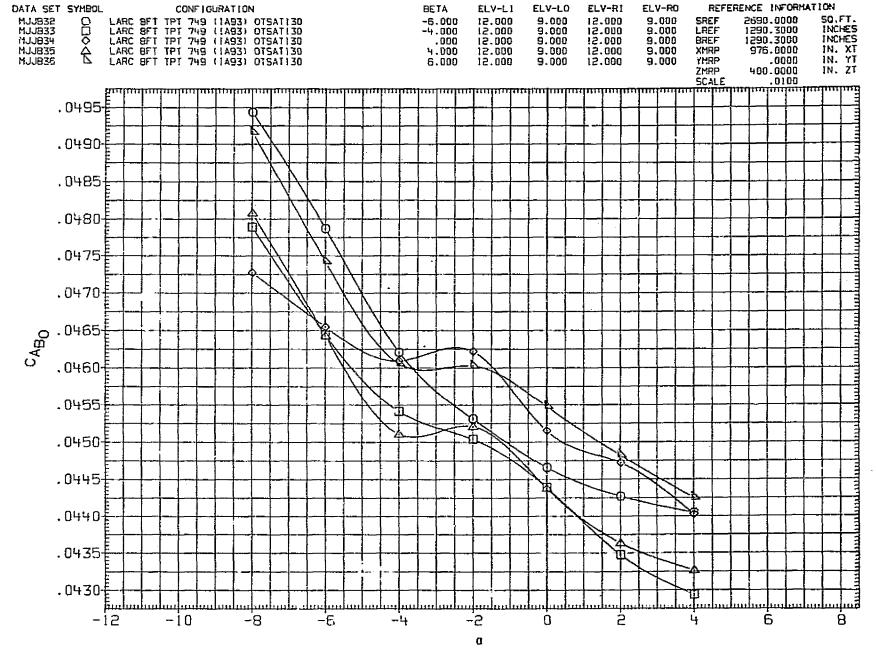


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

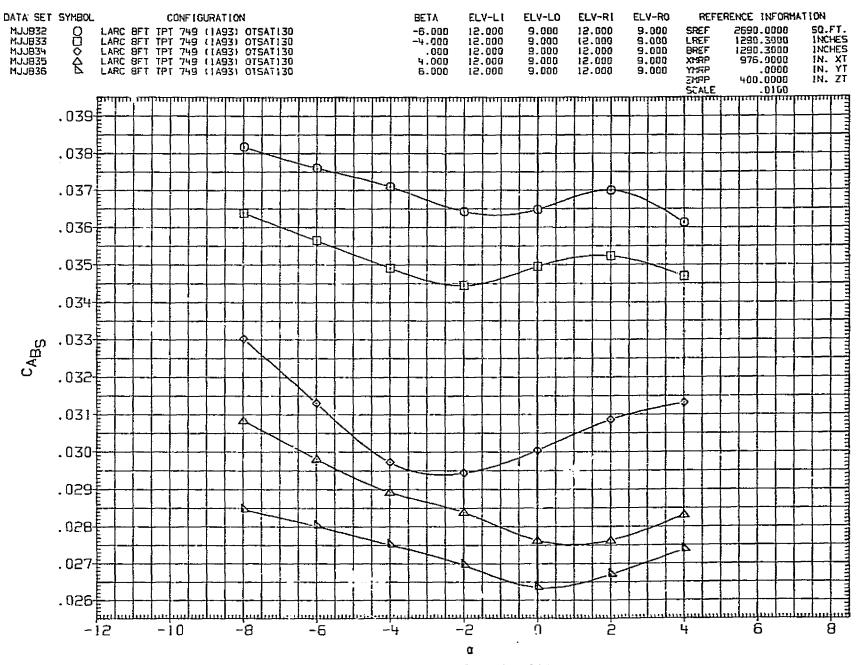


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

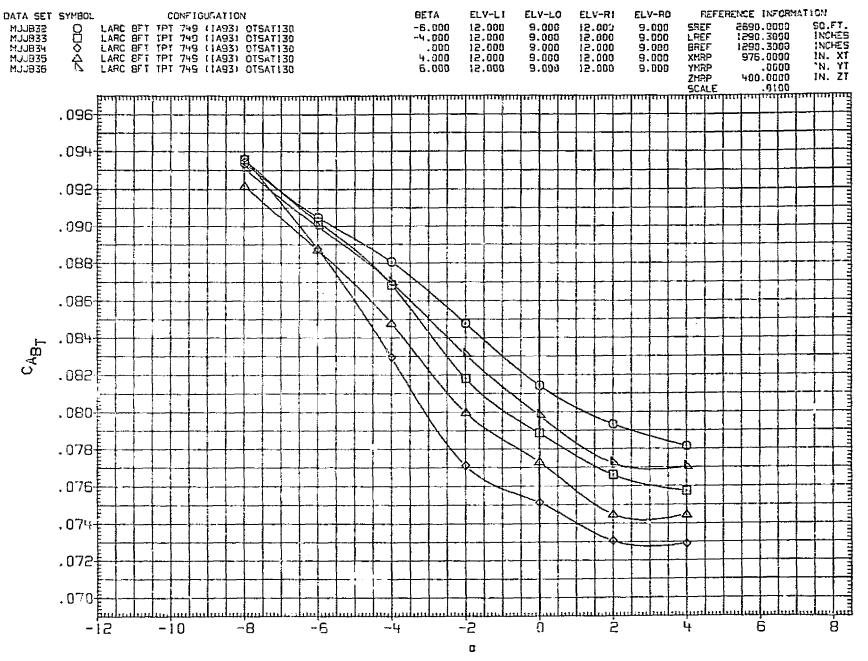


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(A) MACH = .90 PAGE 114

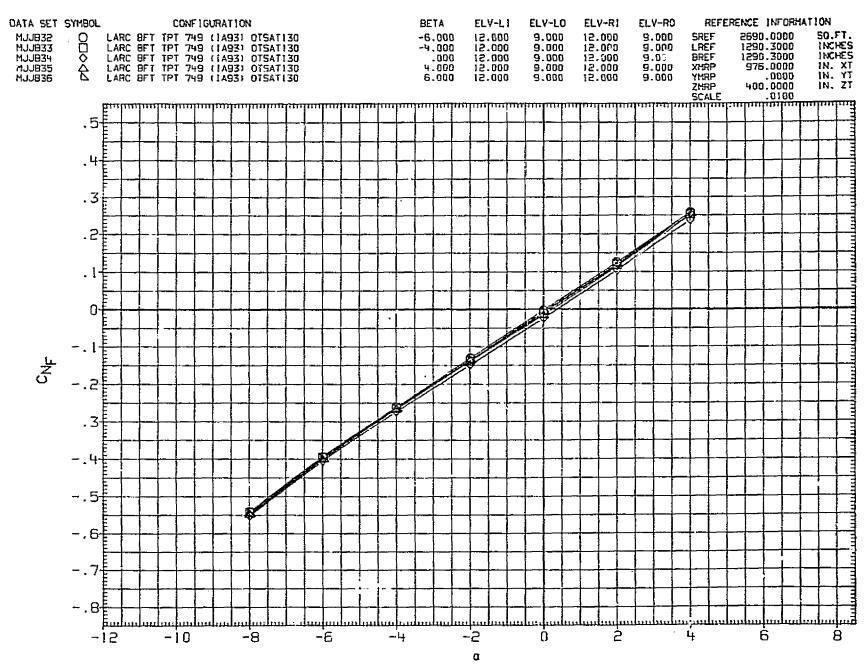


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

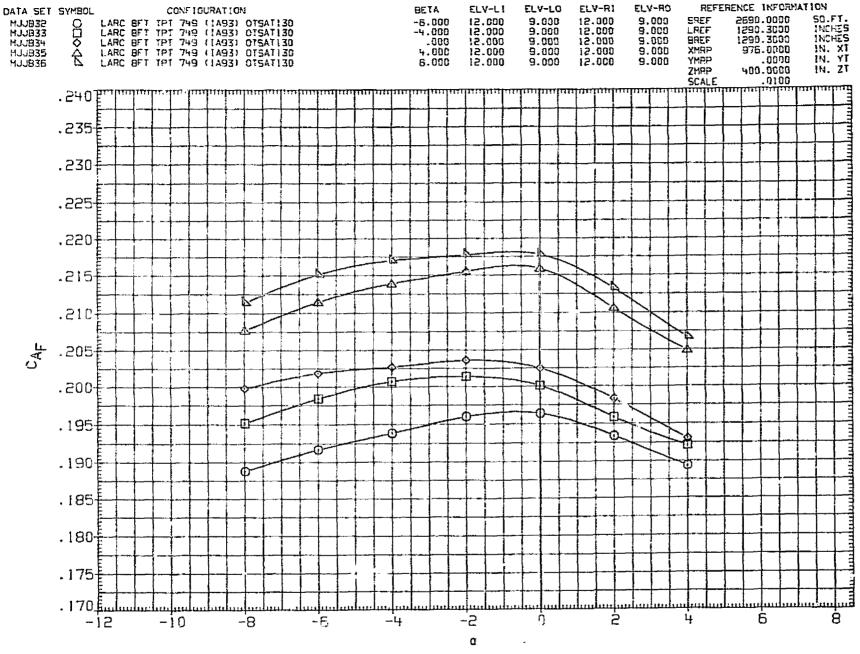


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

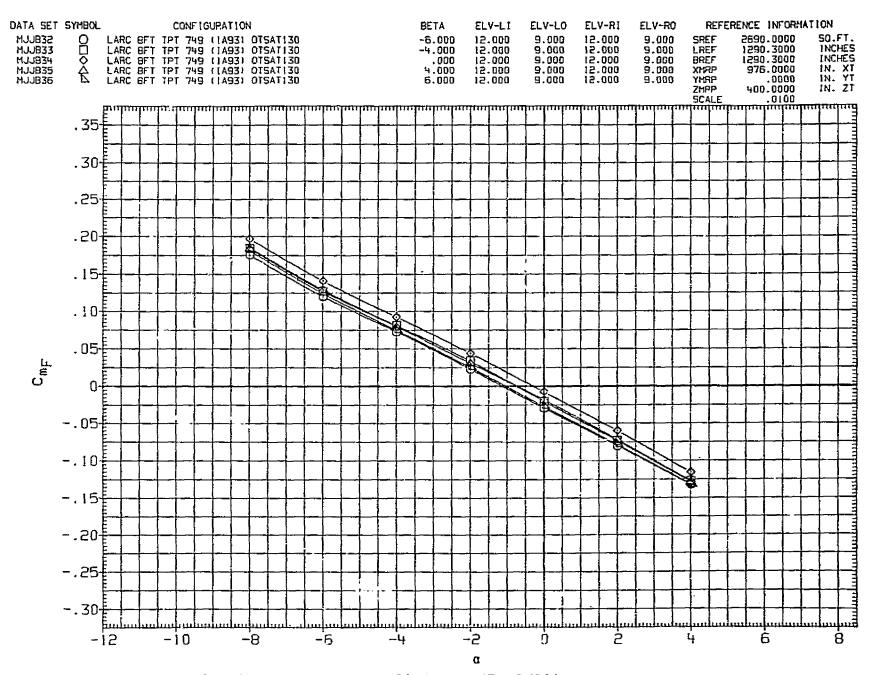


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

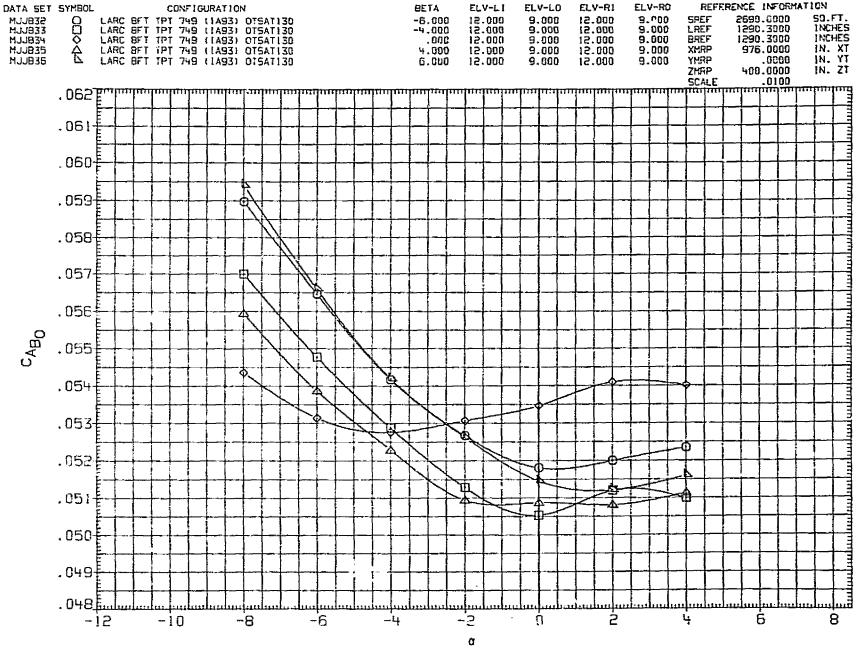


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

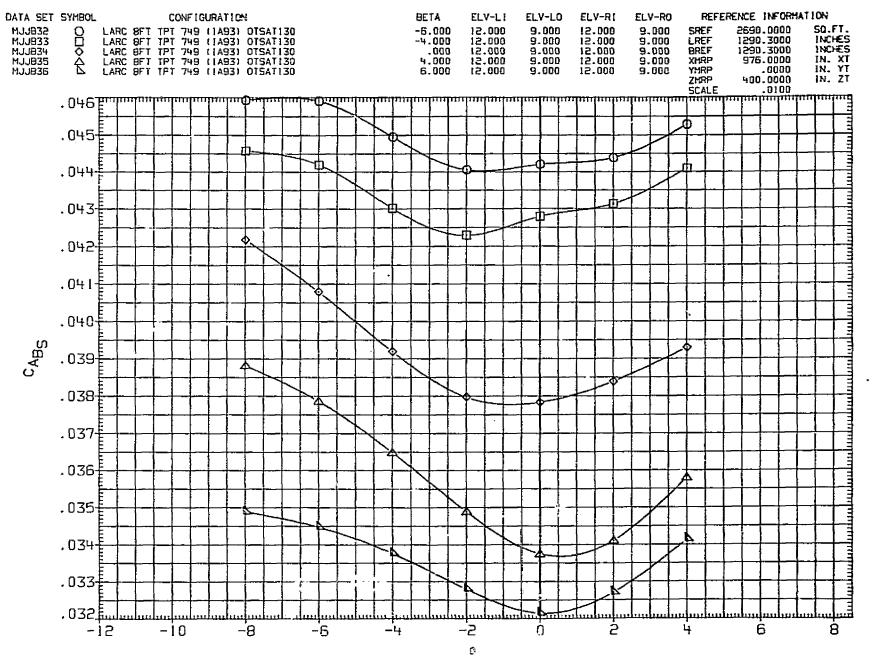


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

.98

(B)MACH =

PAGE 119

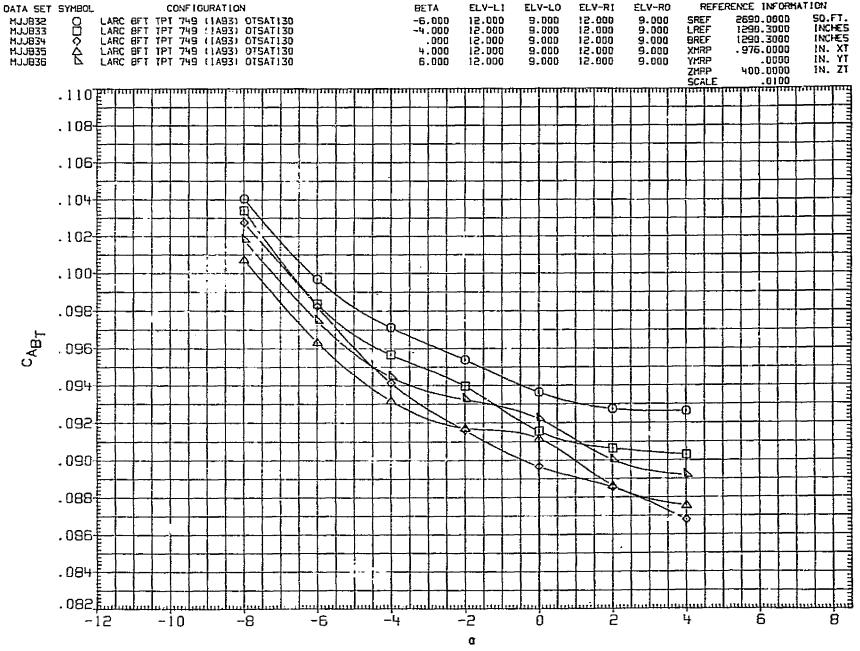


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

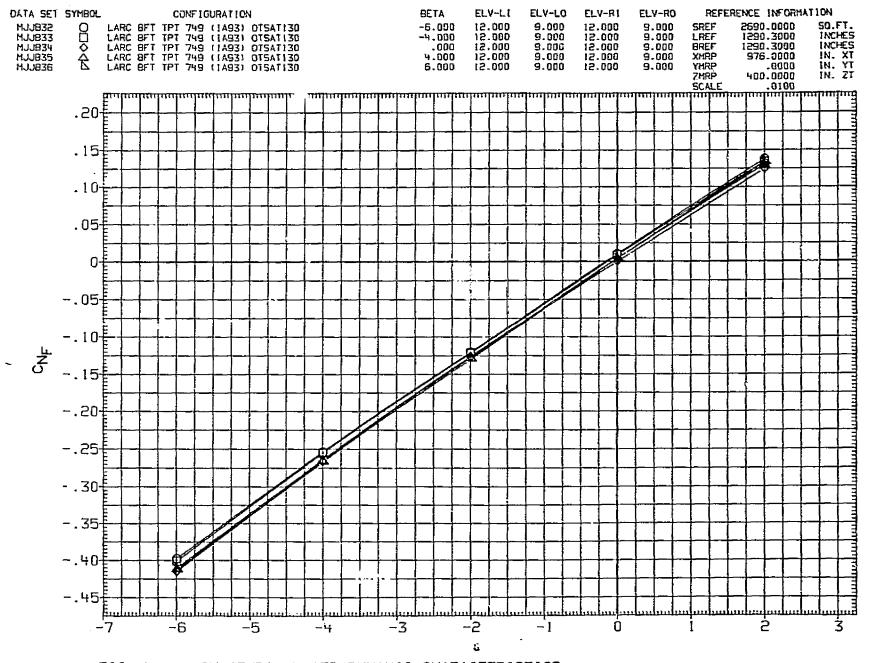


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

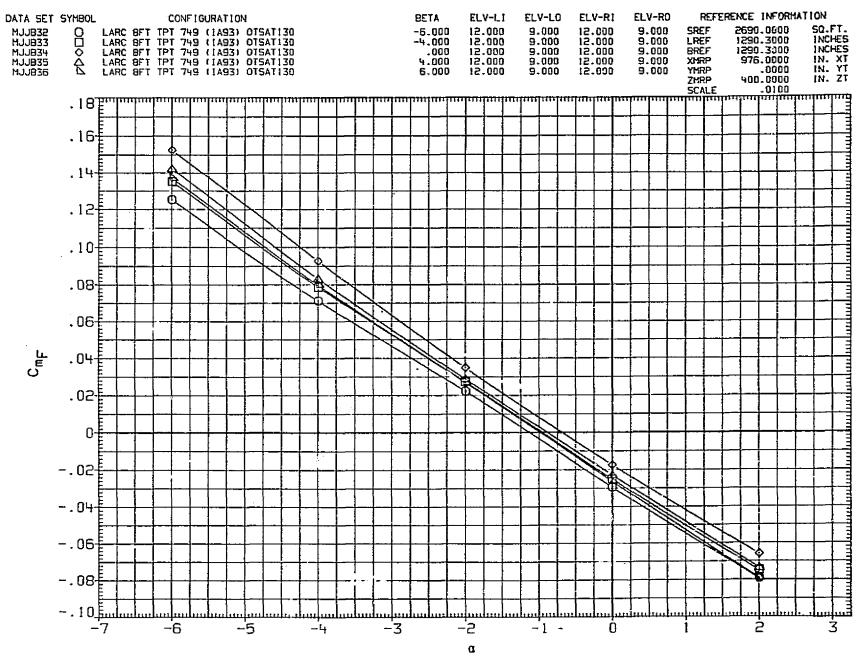
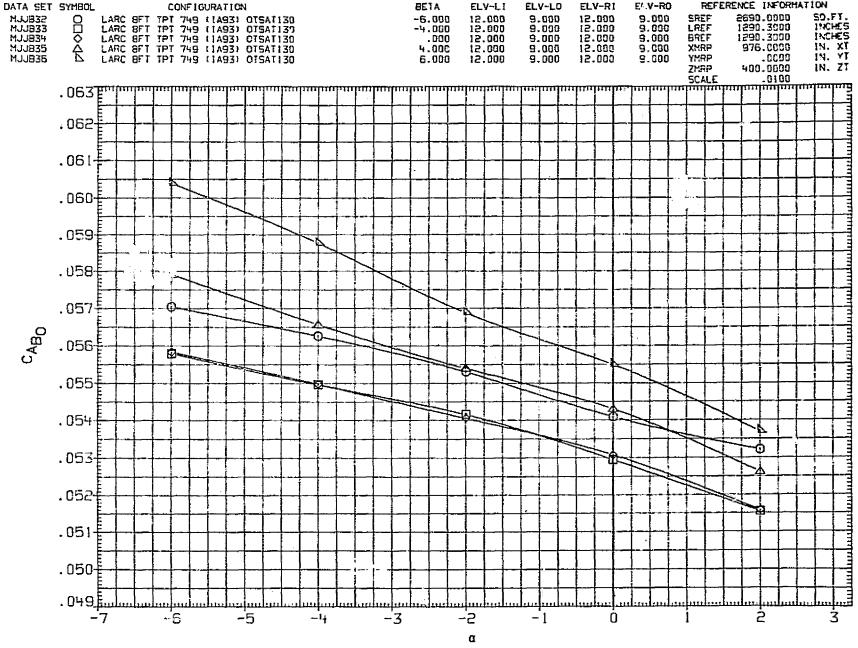


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



LONGITUDINAL AERODYNAMIC CHARACTERISTICS FIG. 4

REFERENCE INFORMATION

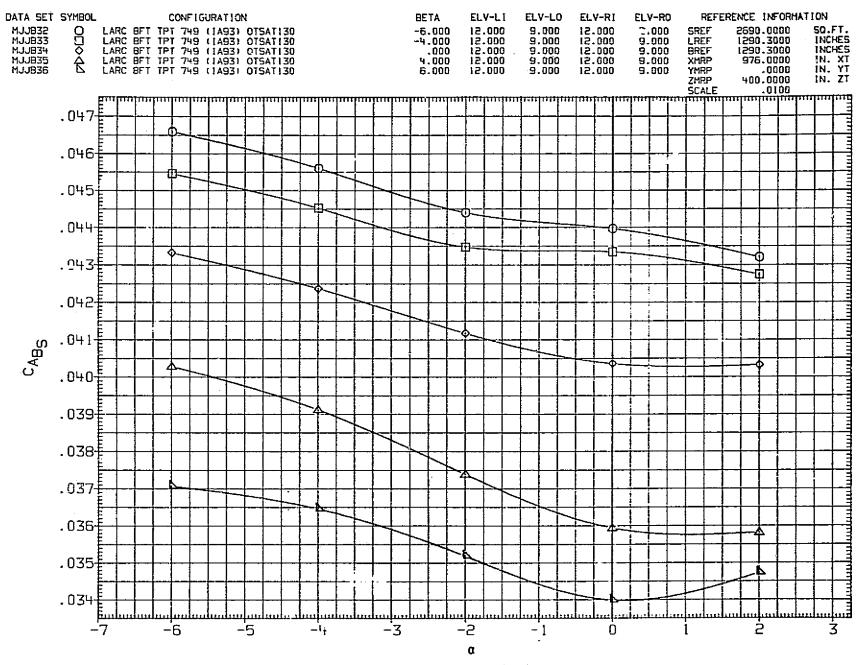


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

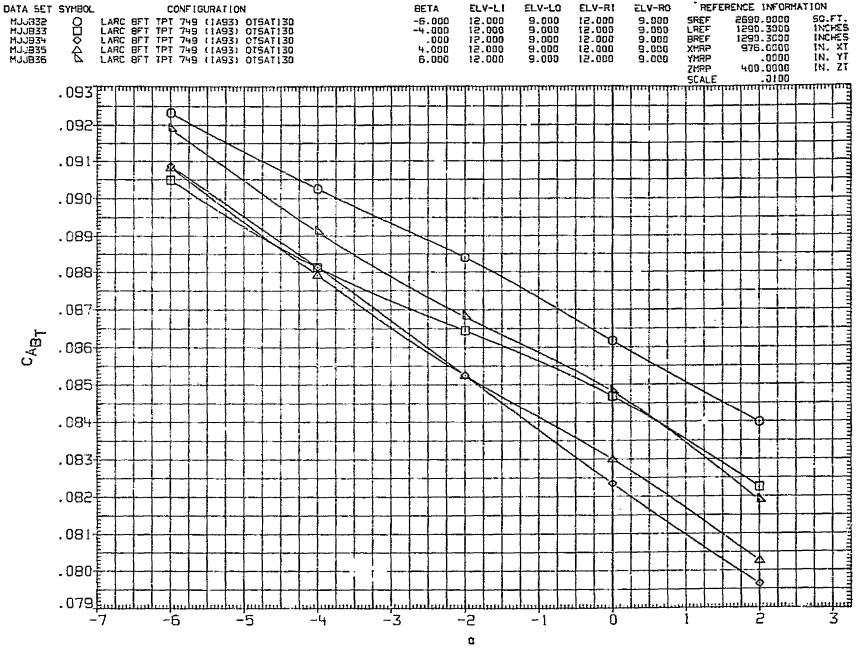


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

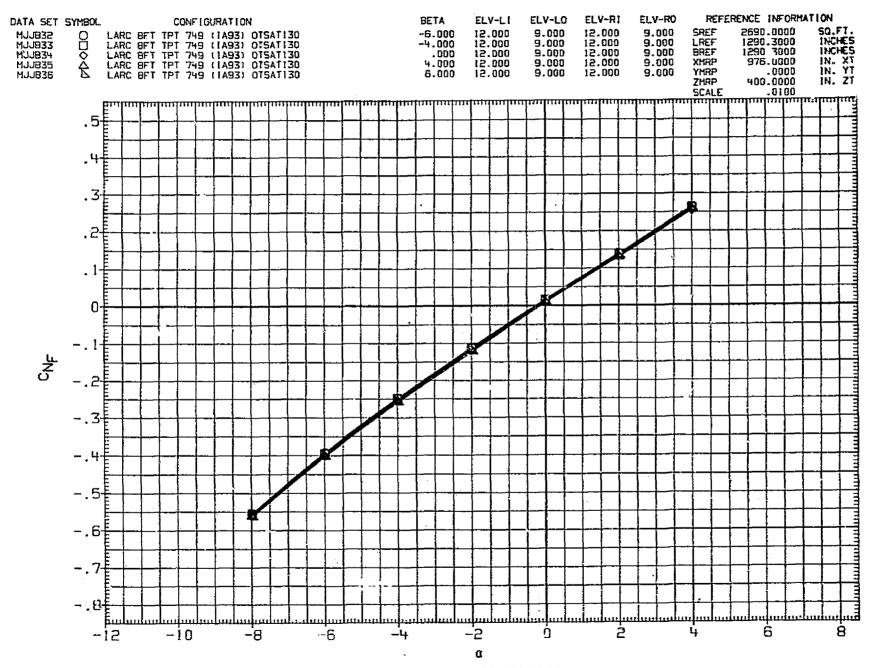


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

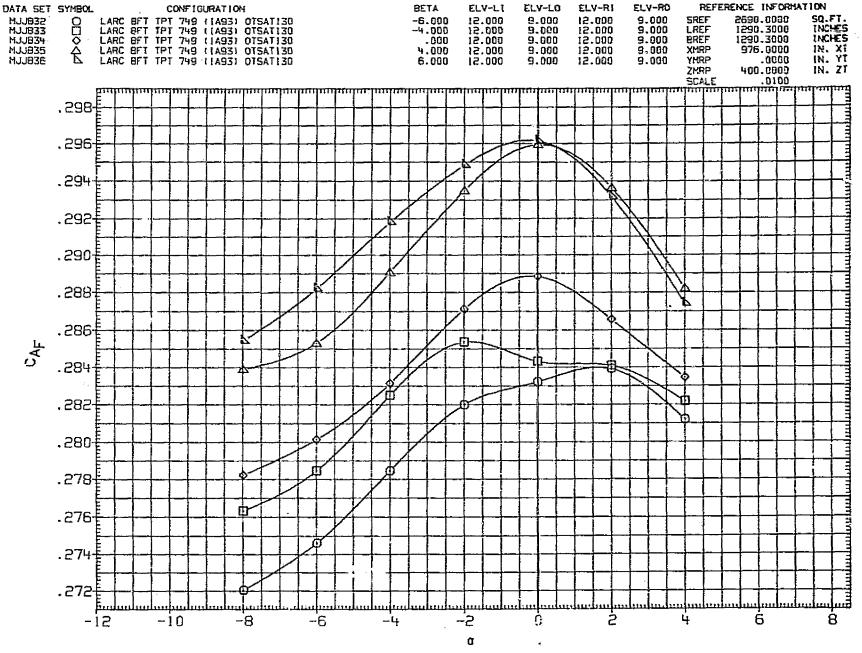


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

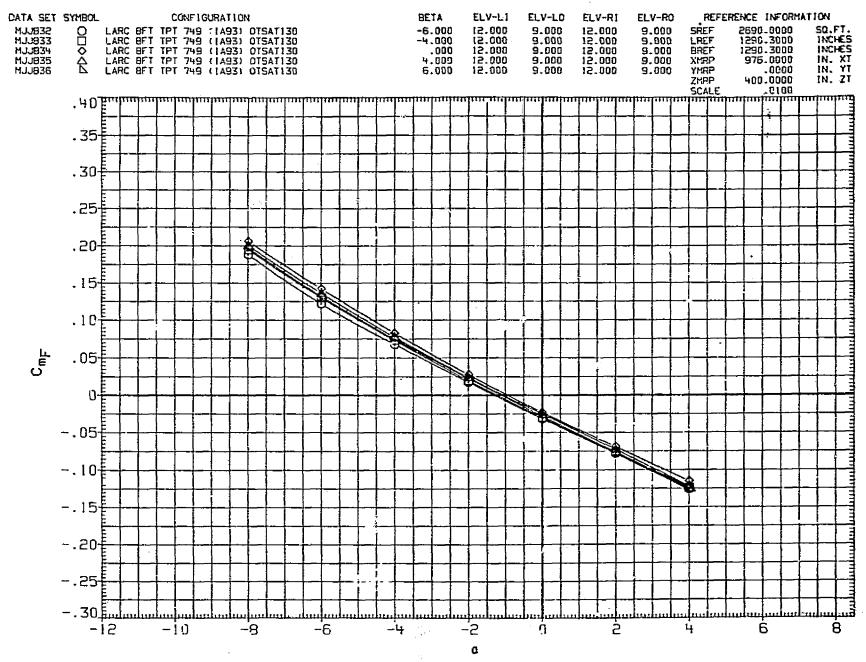


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

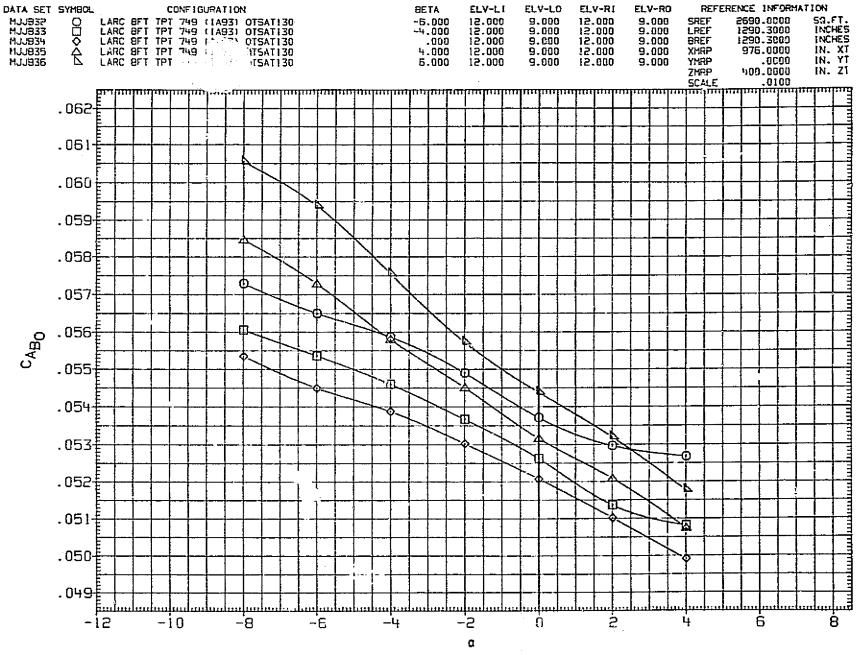


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

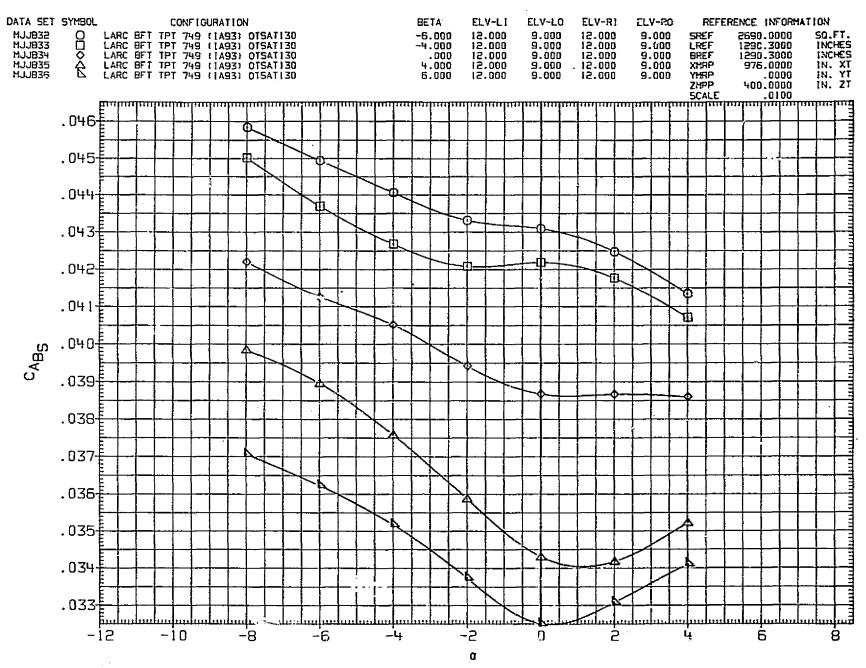


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20 PAGE 131

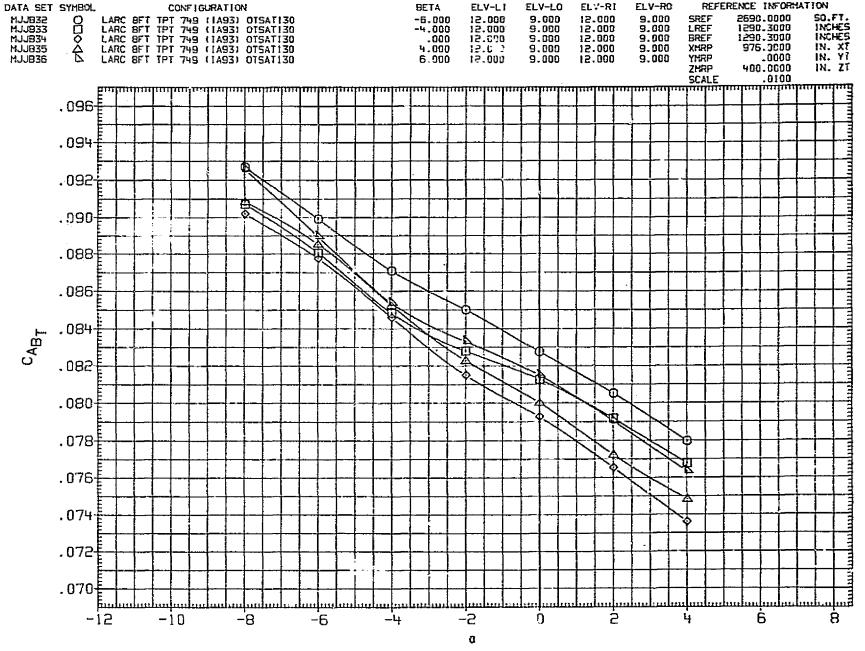


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

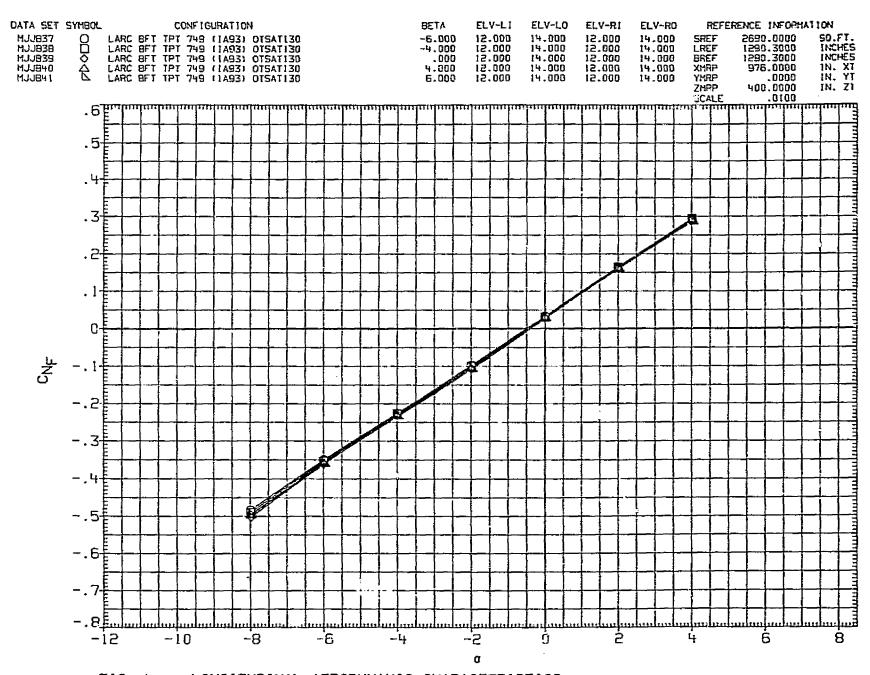


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

PAGE 133

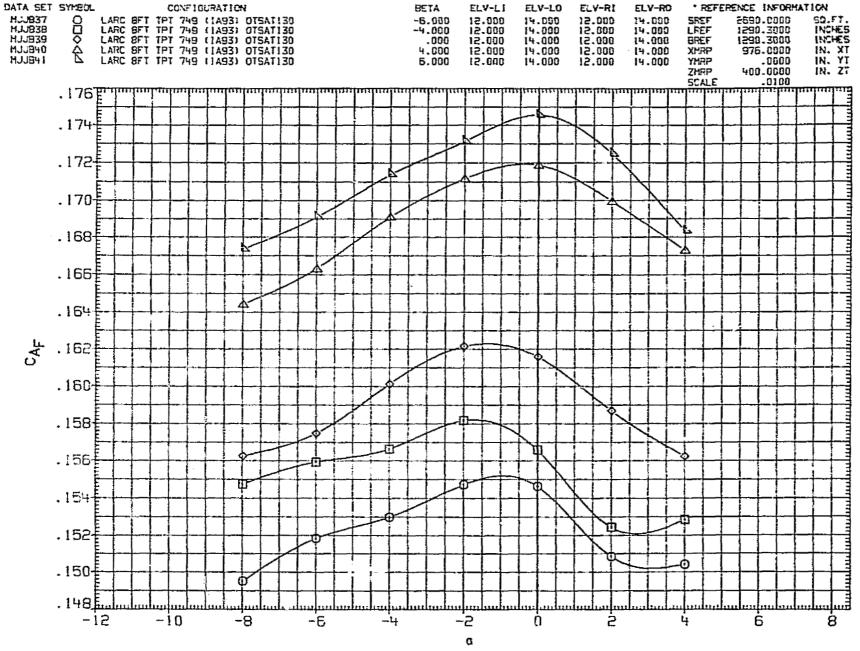


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

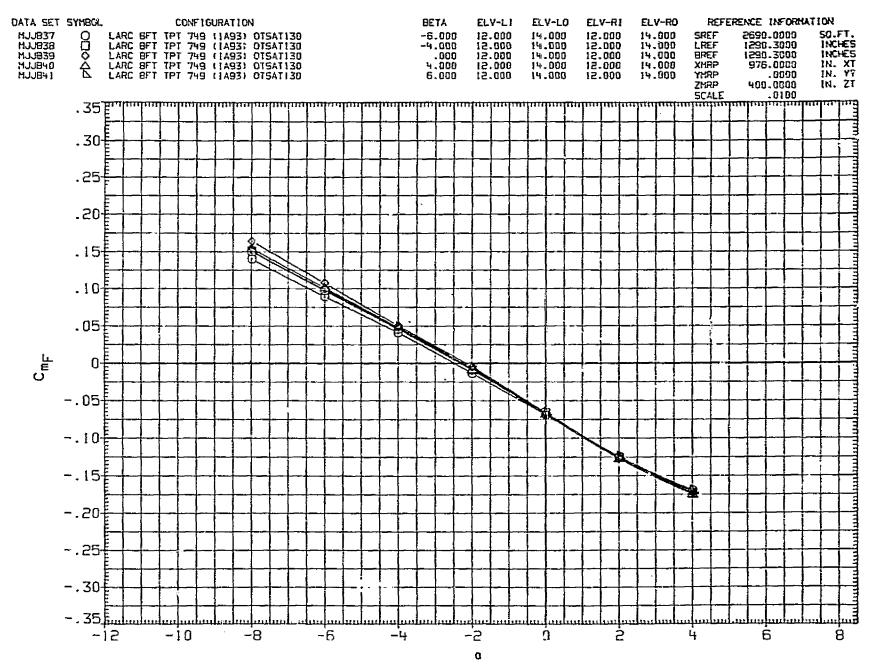


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

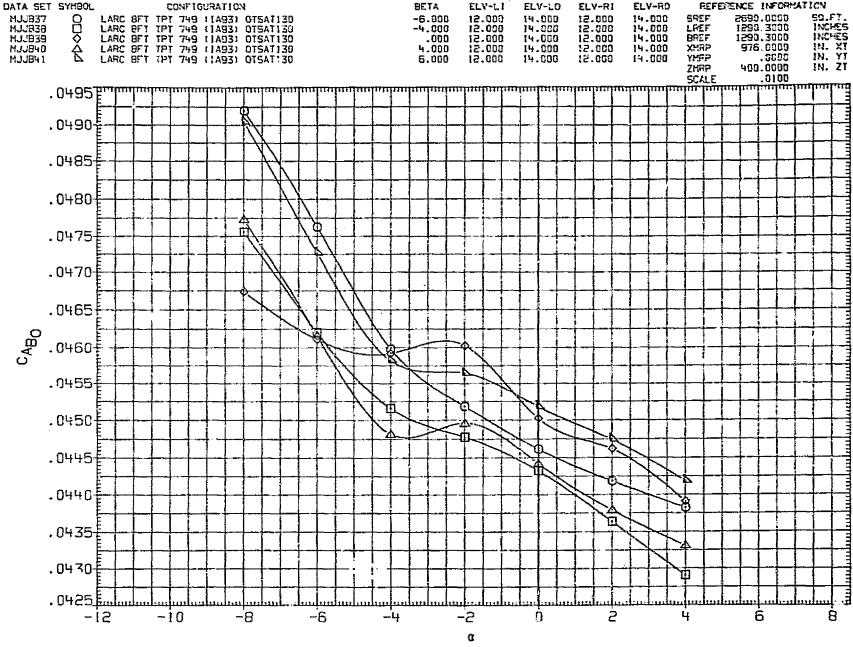


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

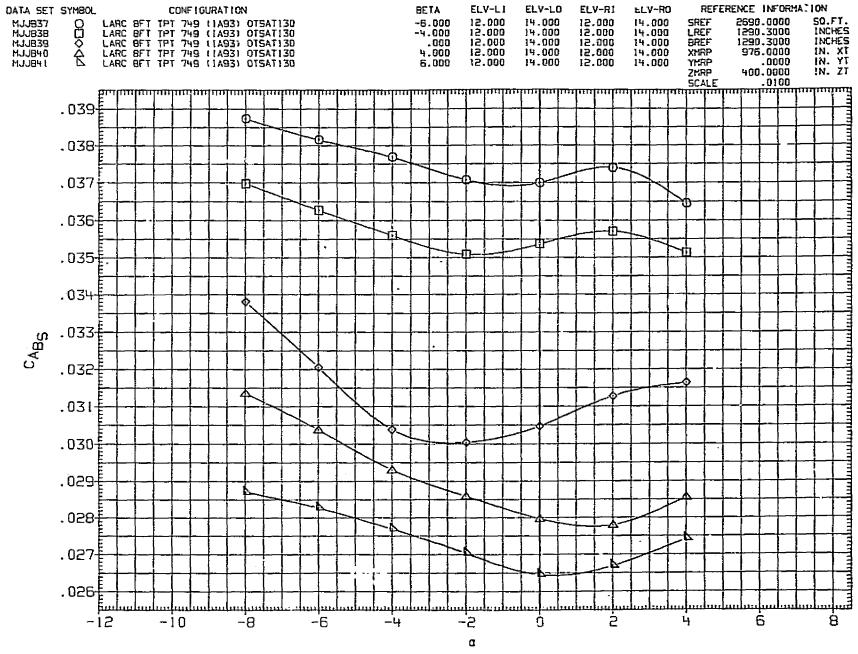


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

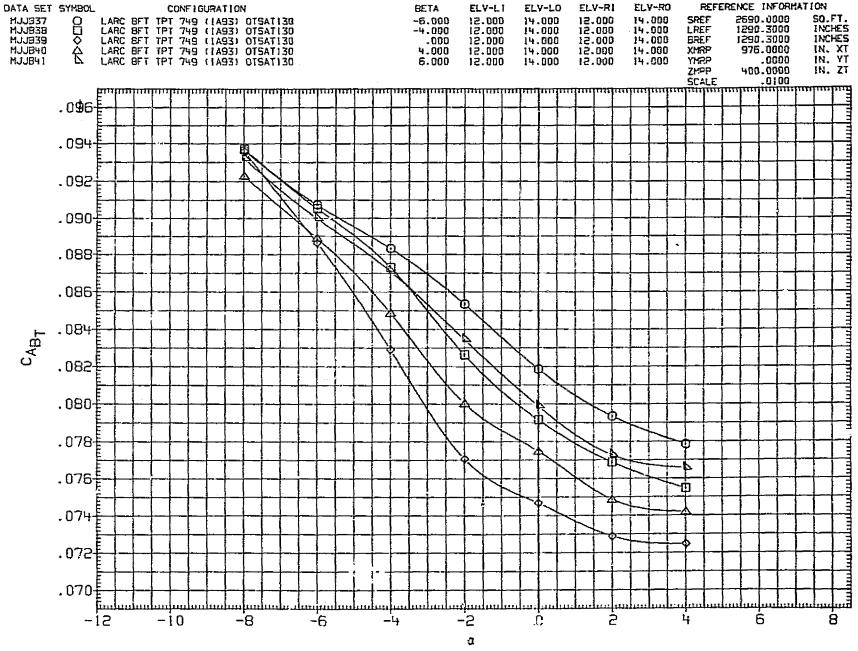


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

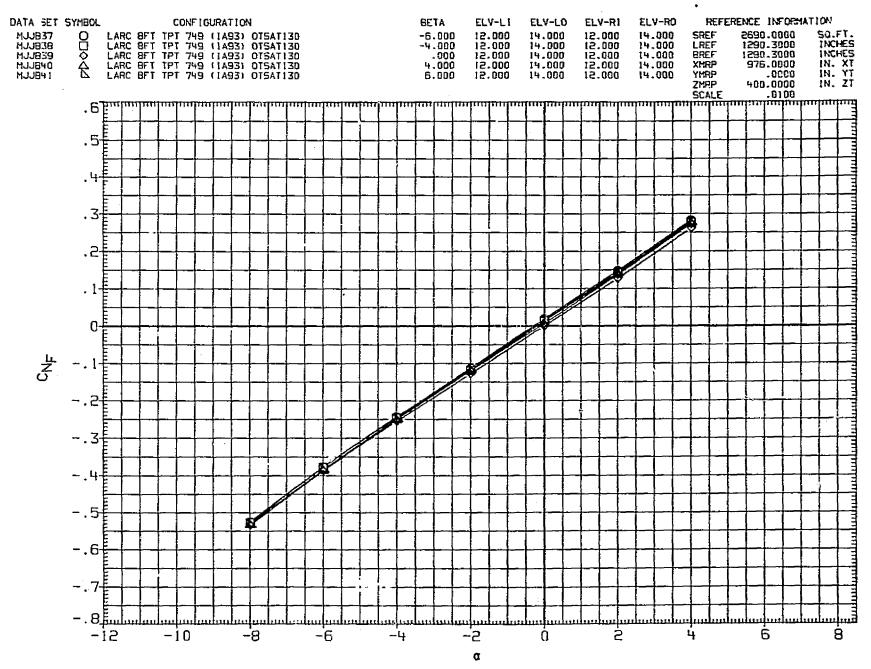


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

PAGE 139

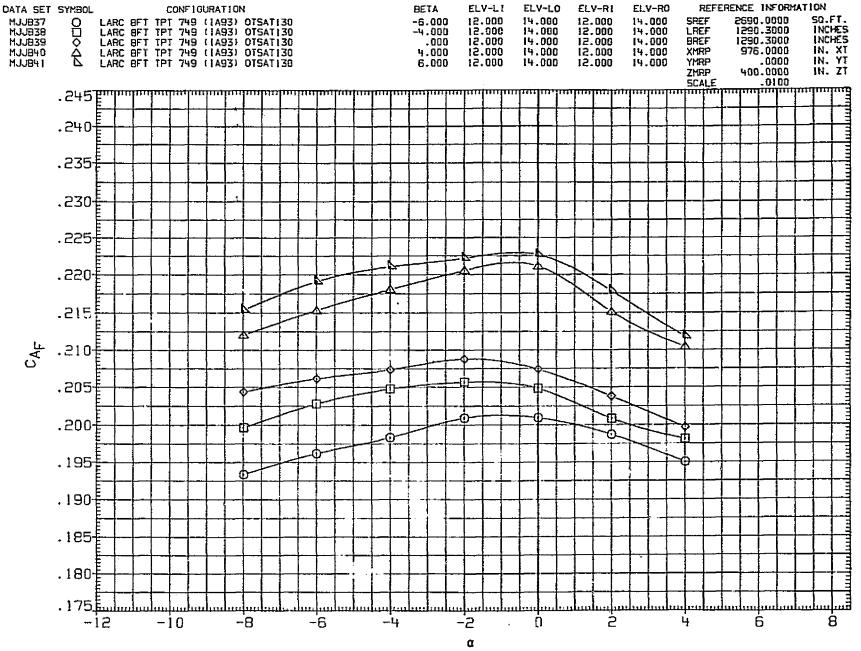


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

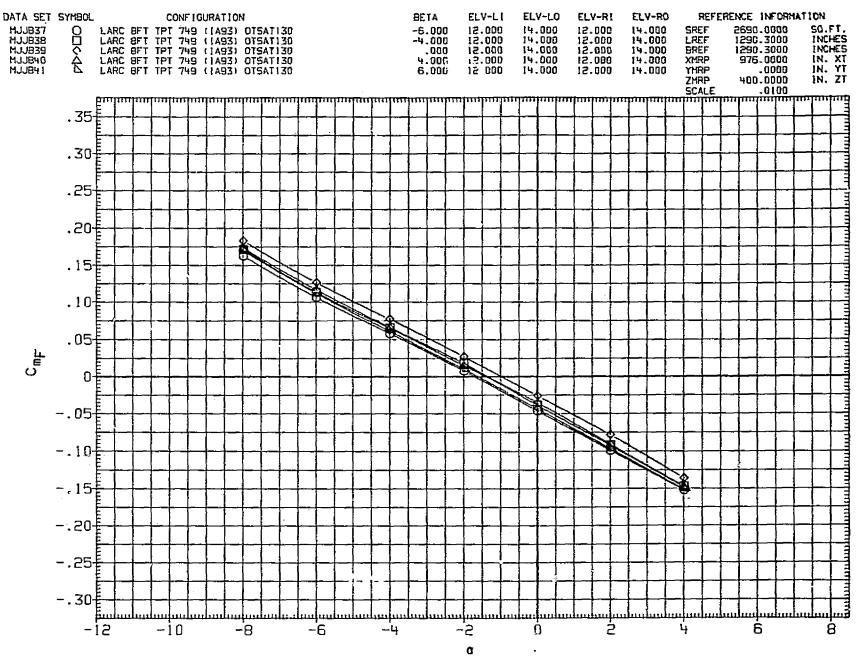


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B) MACH = .98PAGE 141

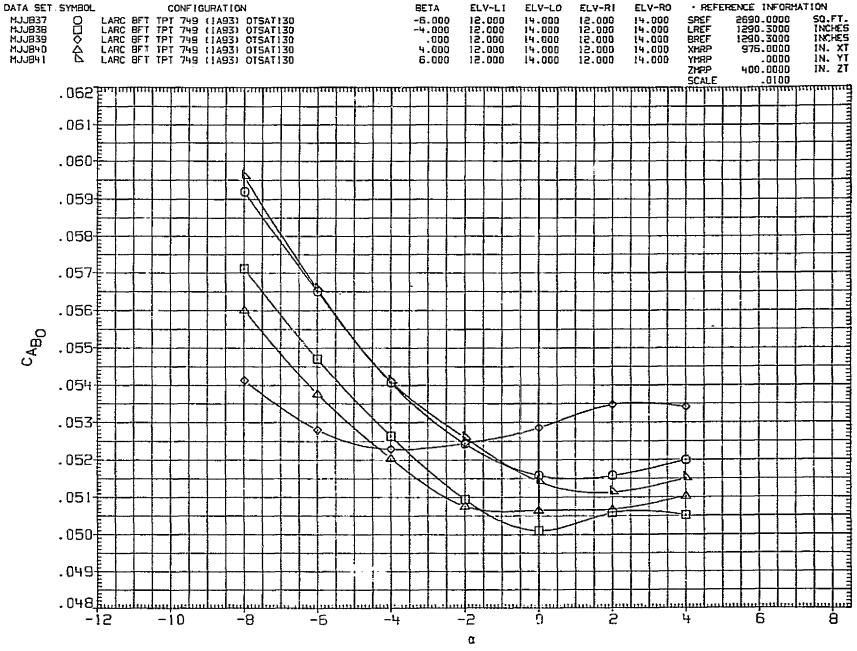


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

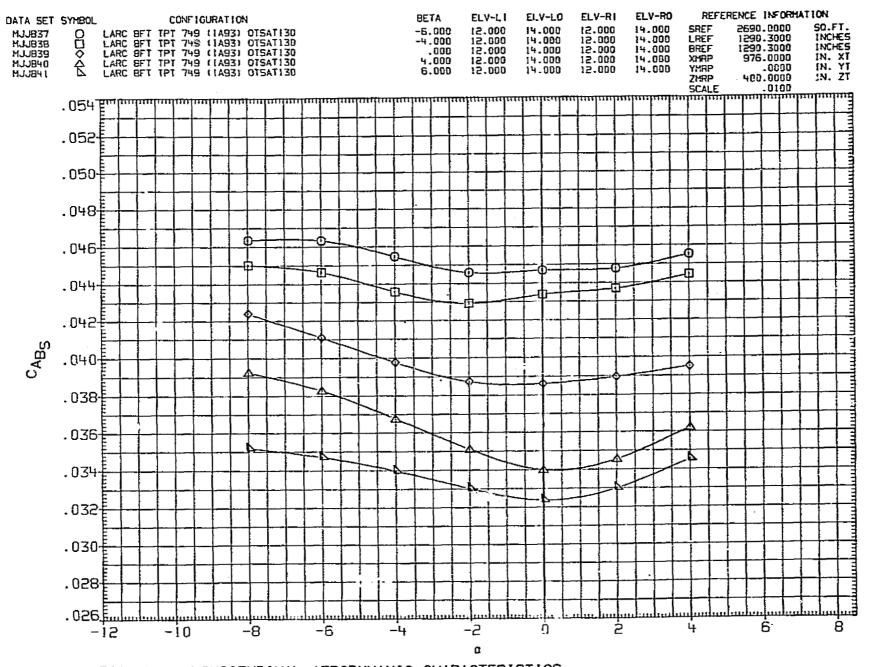


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

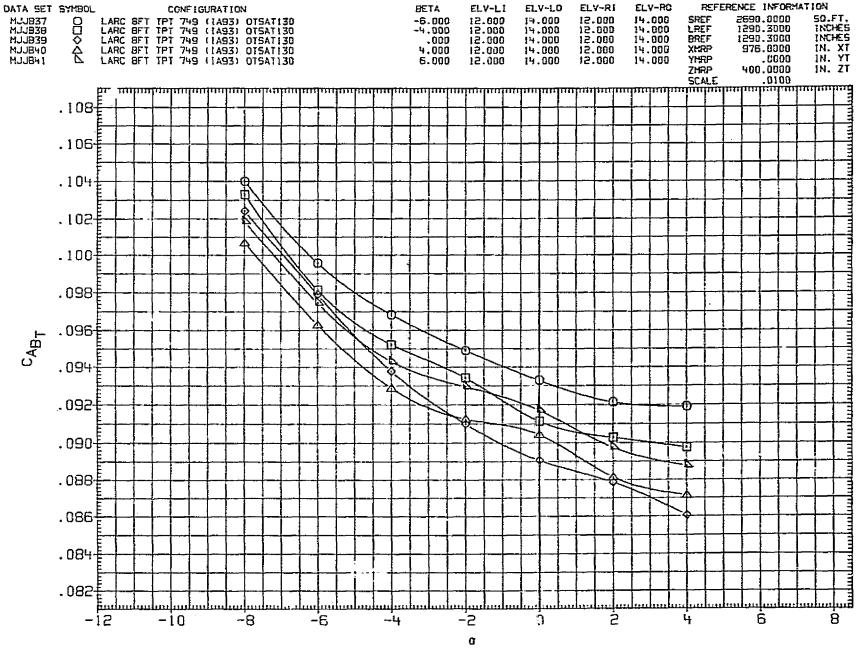
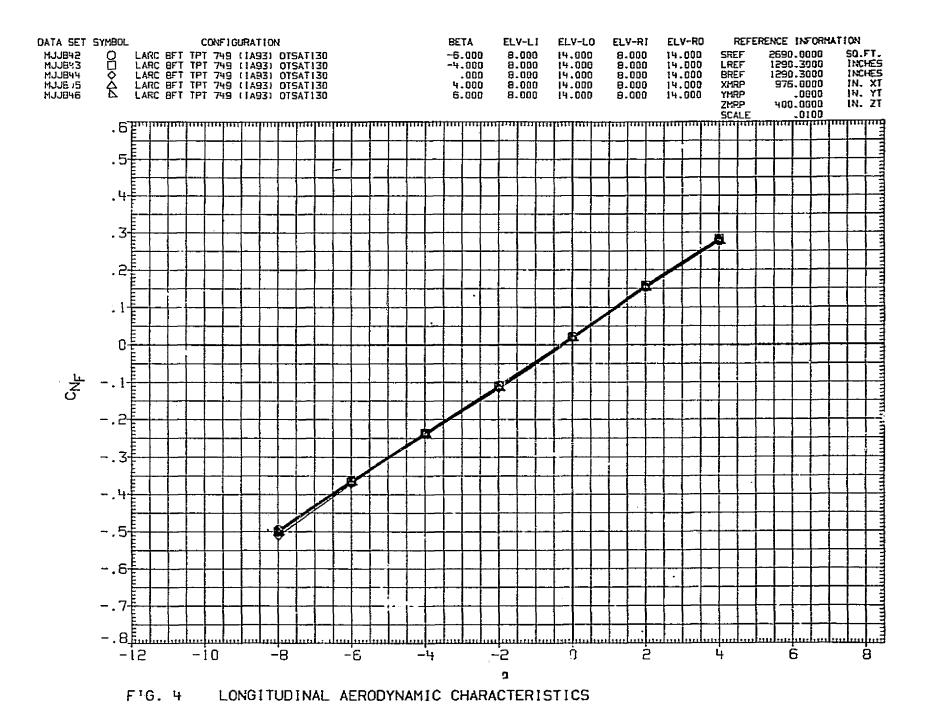


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



PAGE 145

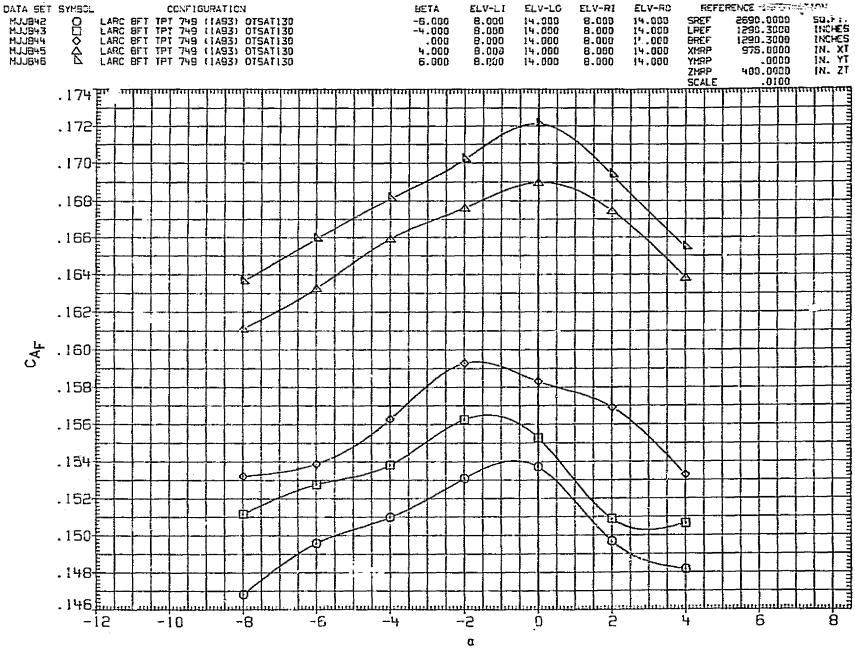


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

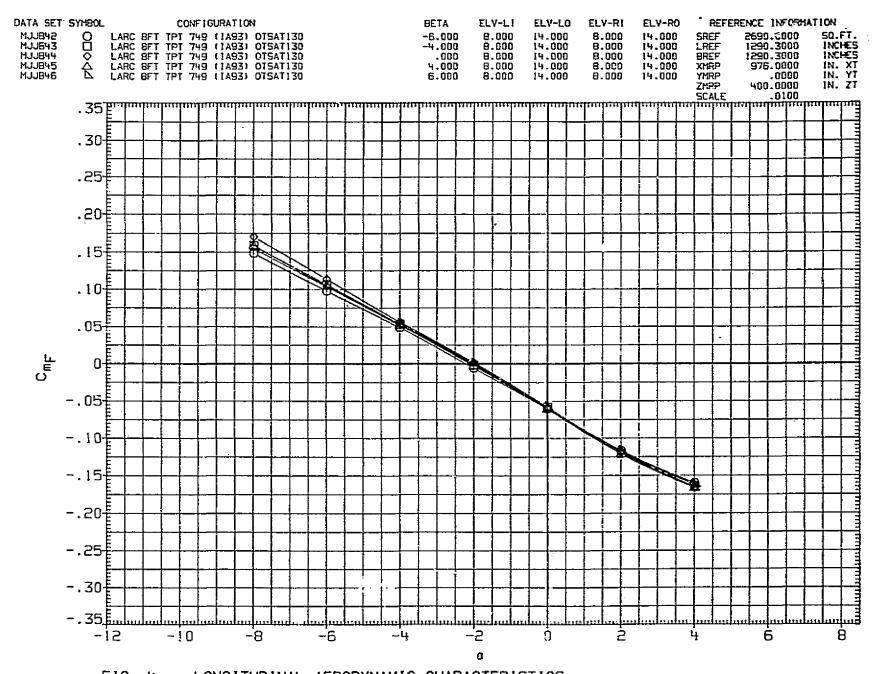


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

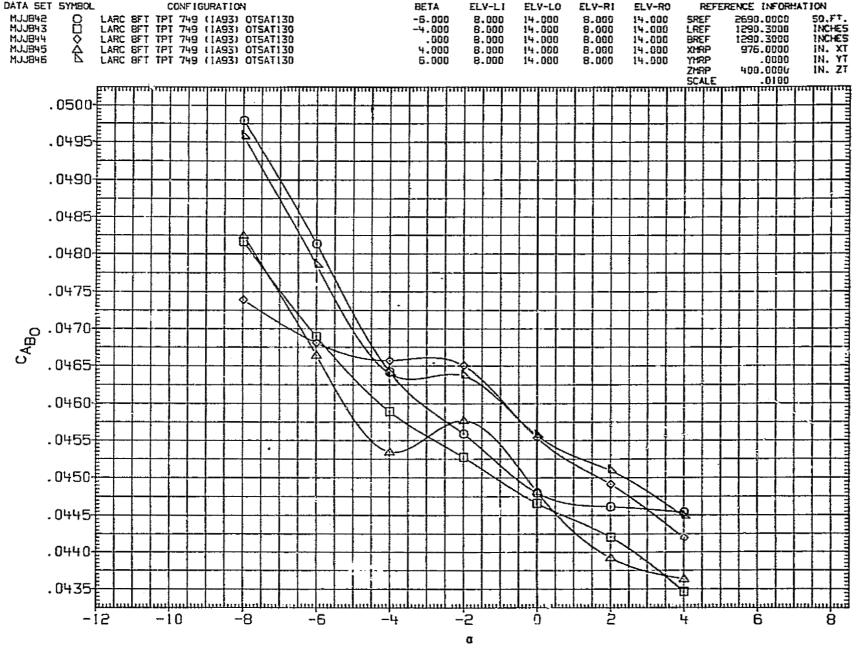


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

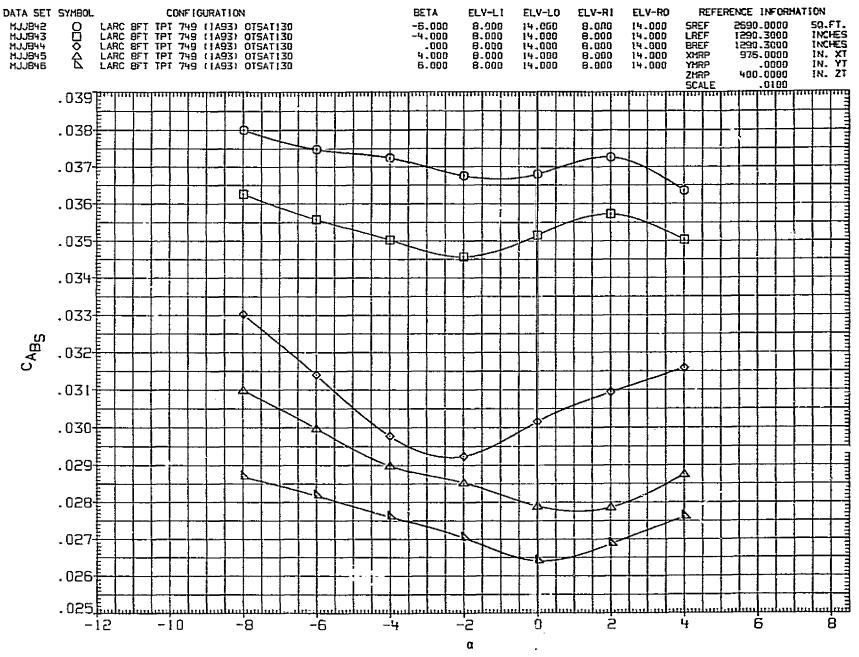
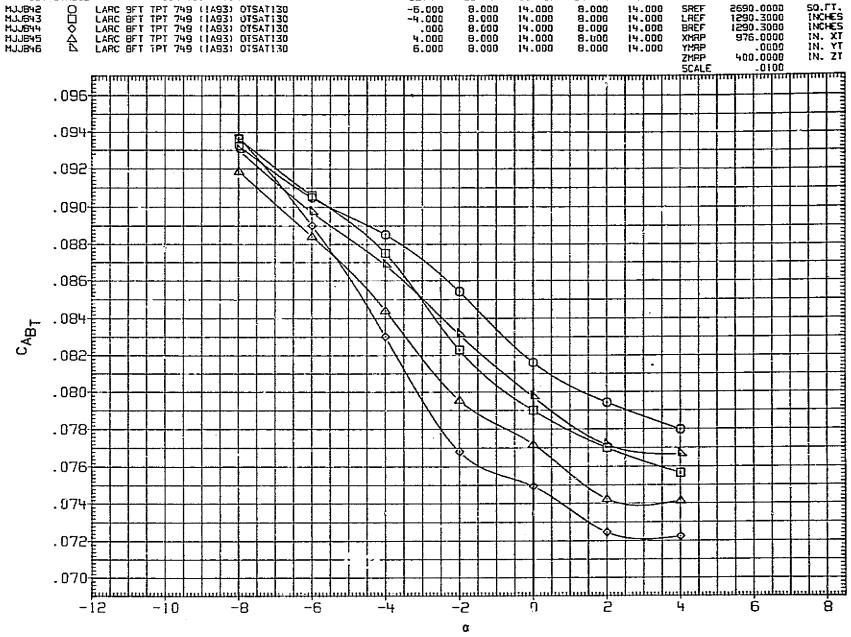


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



BETA

ELV-LI ELV-LO

ELV-RI

ELV-RO

. REFERENCE INFORMATION

FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

DATA SET SYMBOL

CONFIGURATION

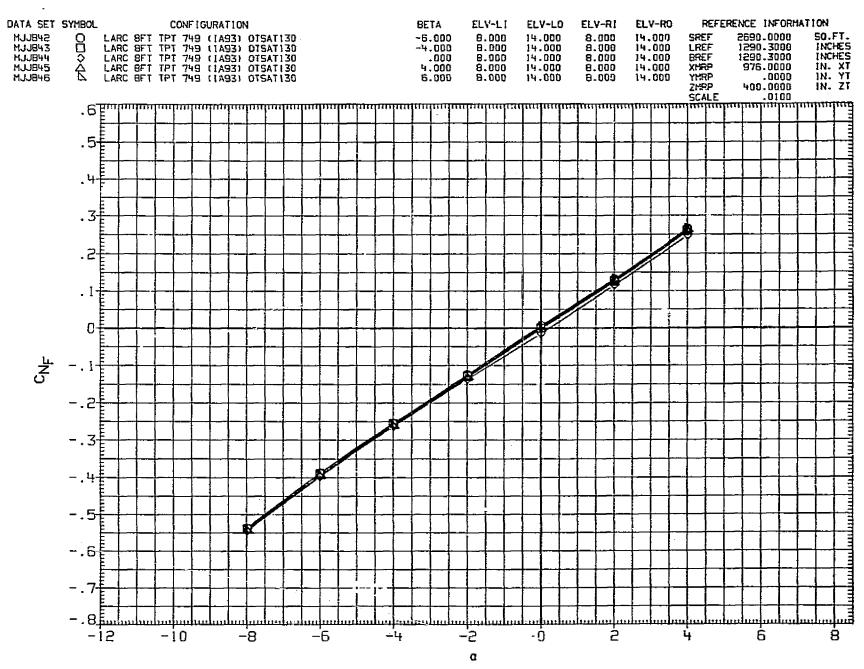


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

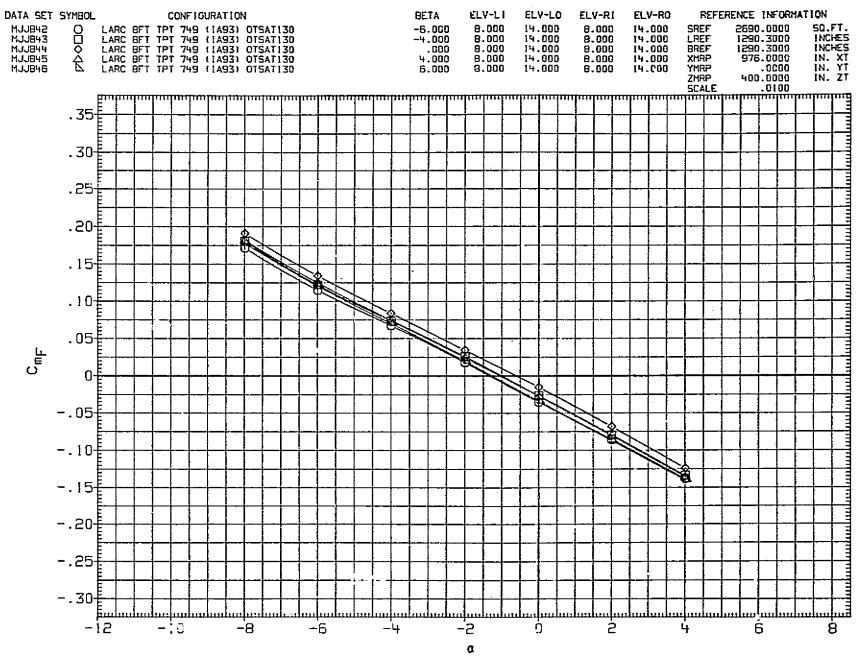


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

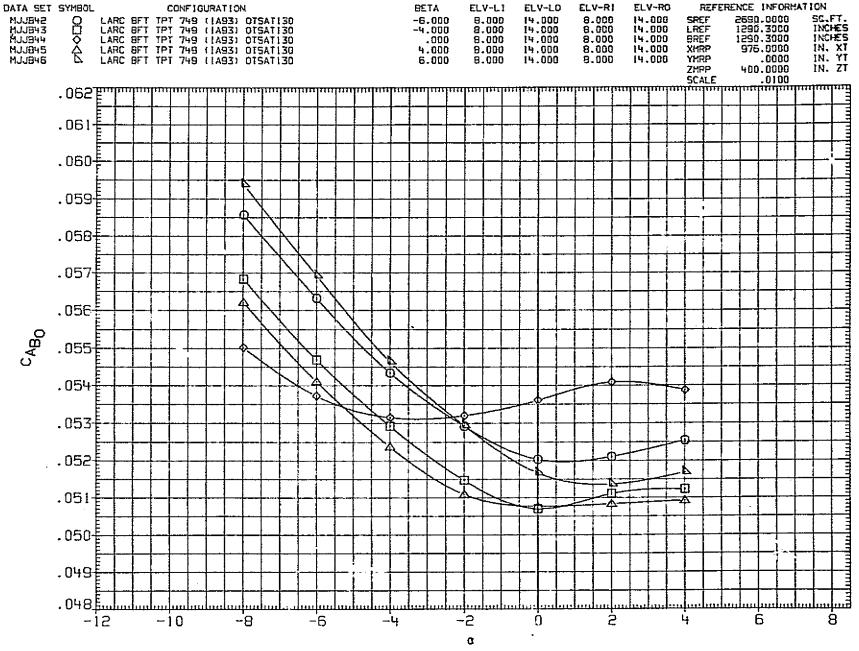


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

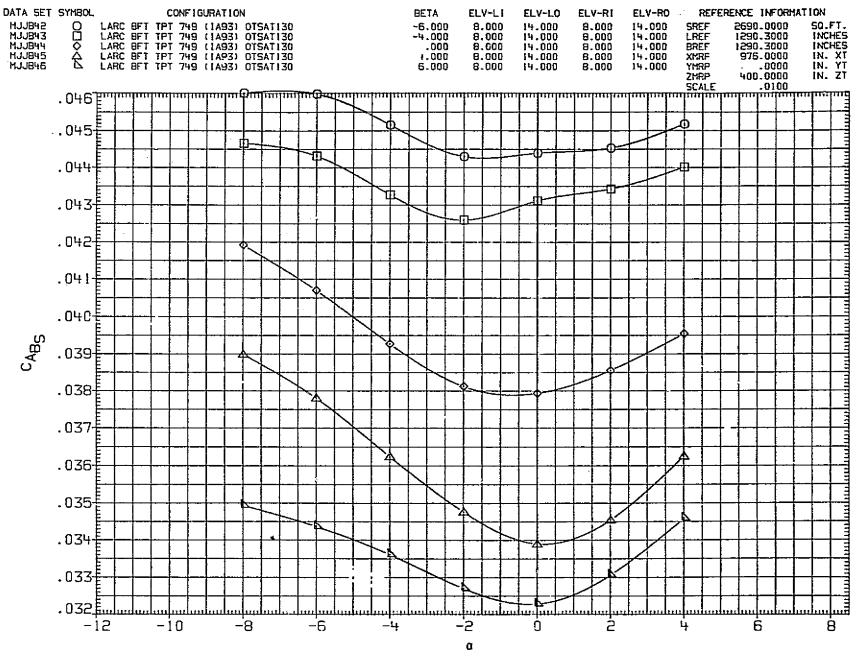
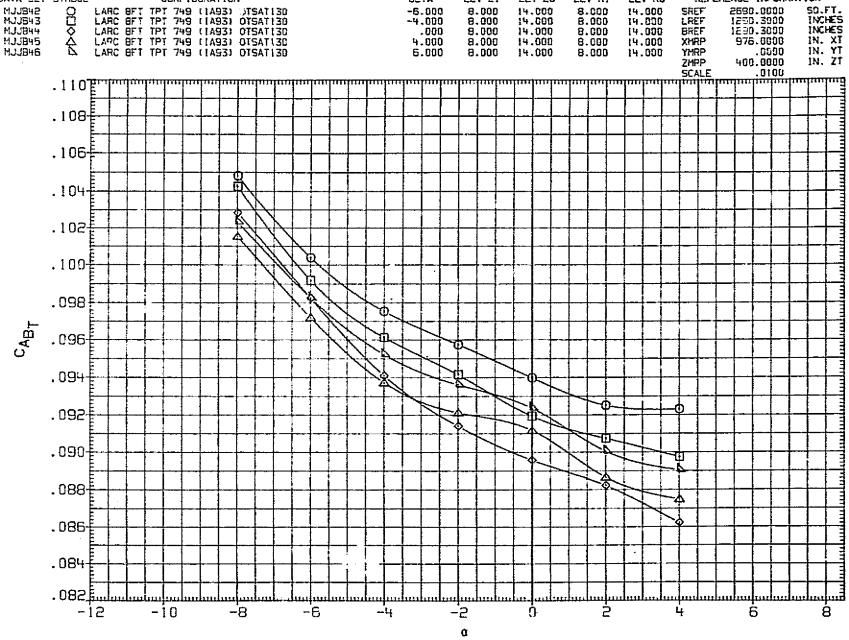


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B) MACH = .98PAGE 155



BETA

ELV-L!

ELV-LO

ELV-RI

ELV-RO

FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B)MACH = .98

DATA SET SYMBOL

CONFIGURATION

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR PAGE 156

REFERENCE INFORMATION

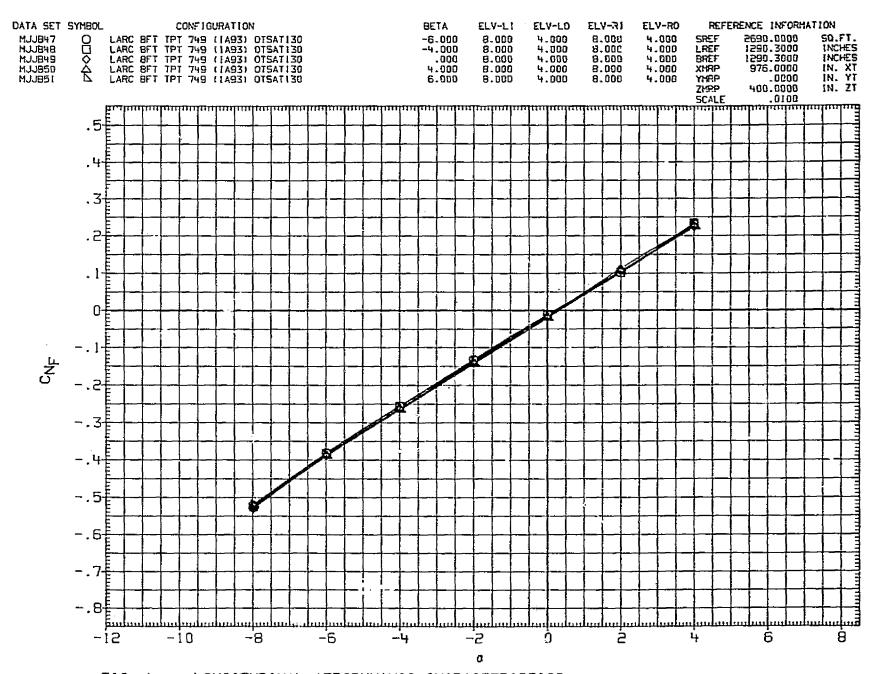


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

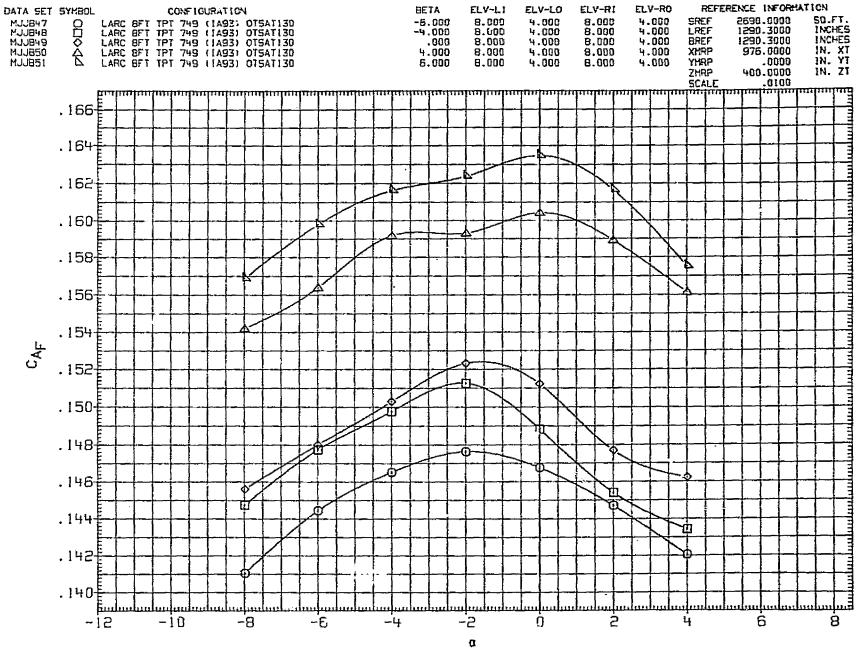


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

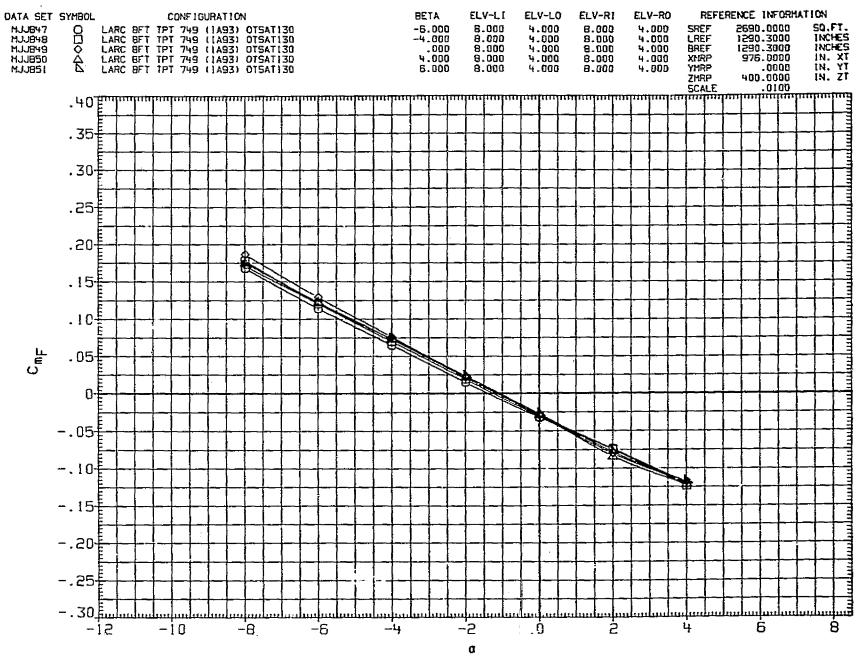


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

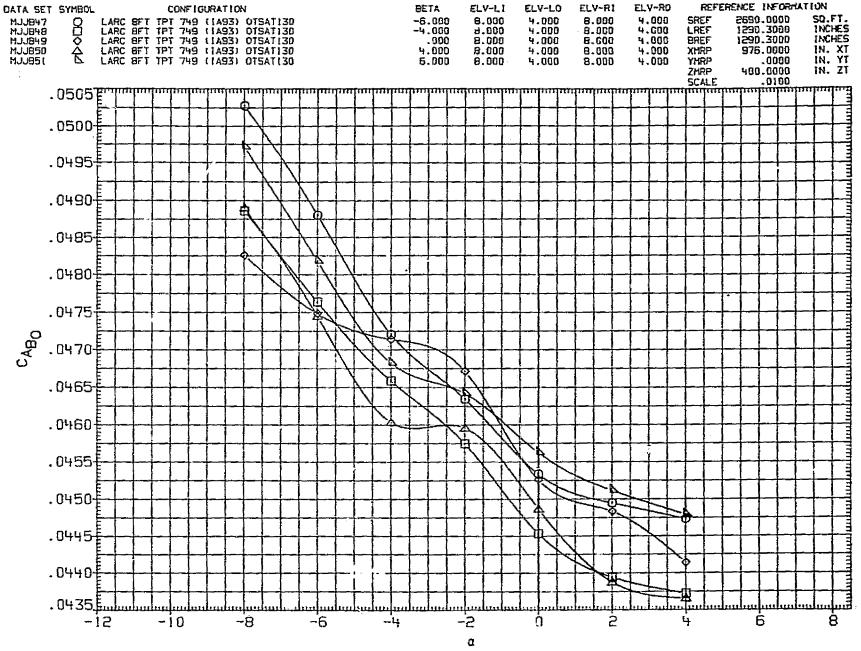


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

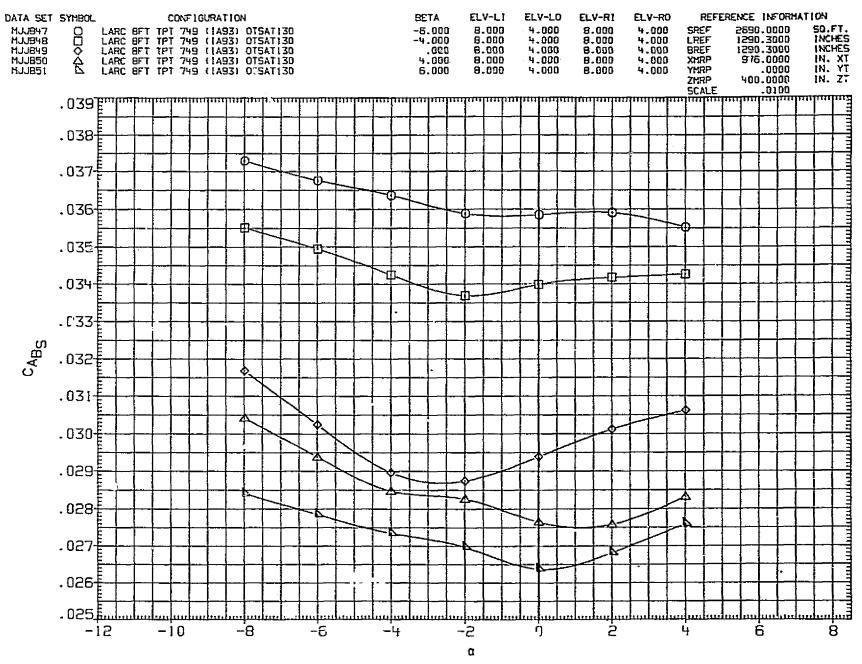


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

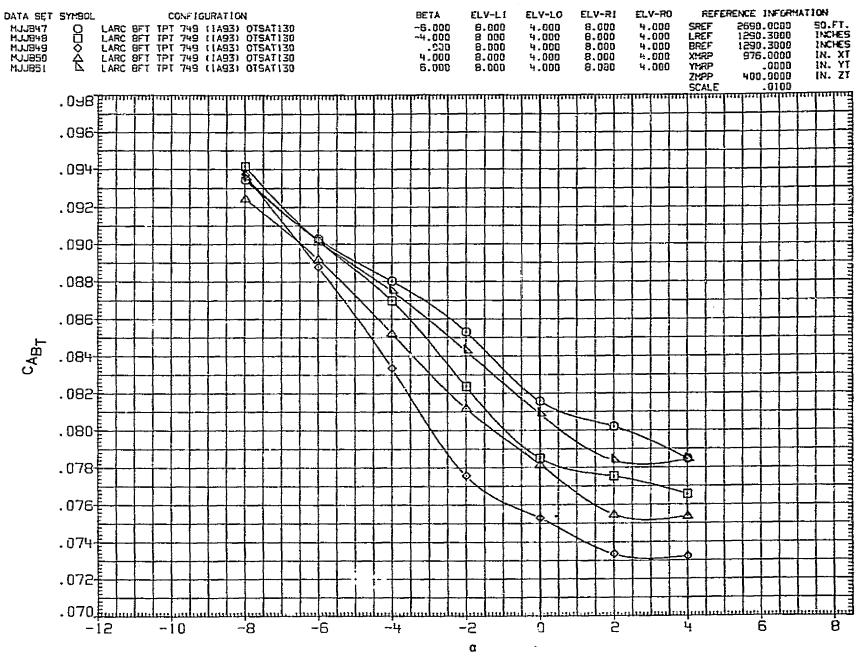


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

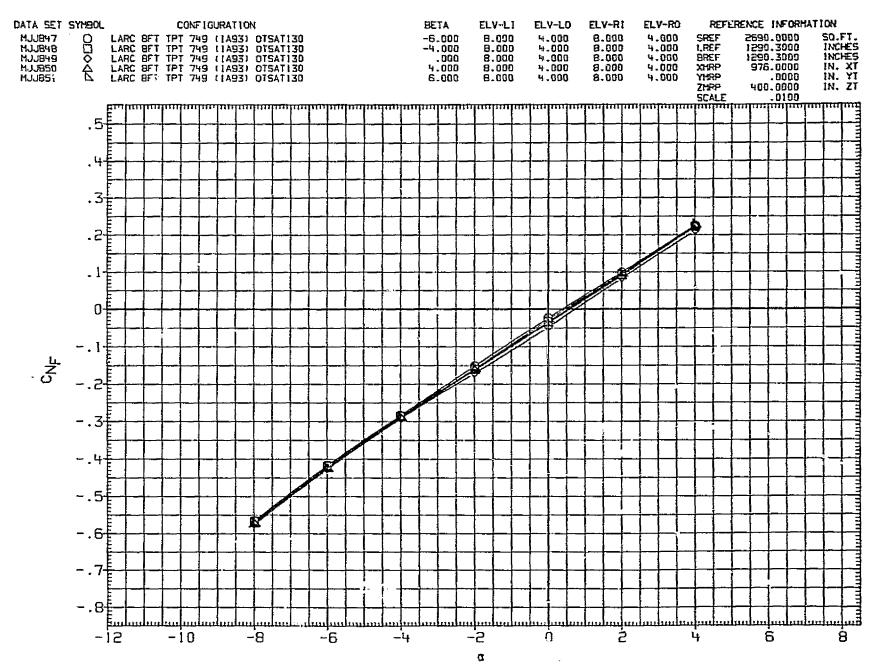
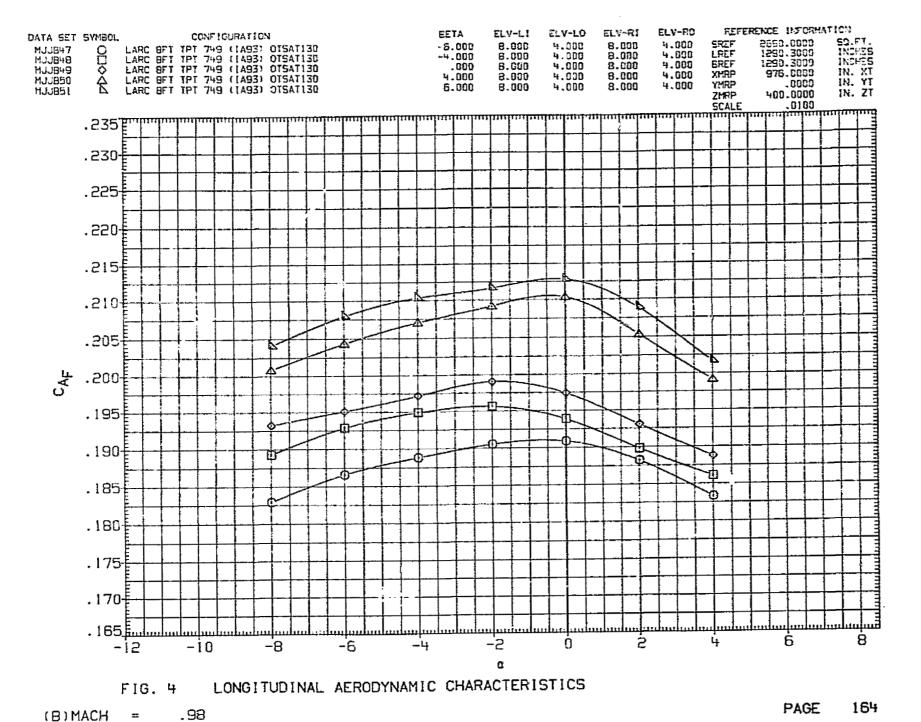


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

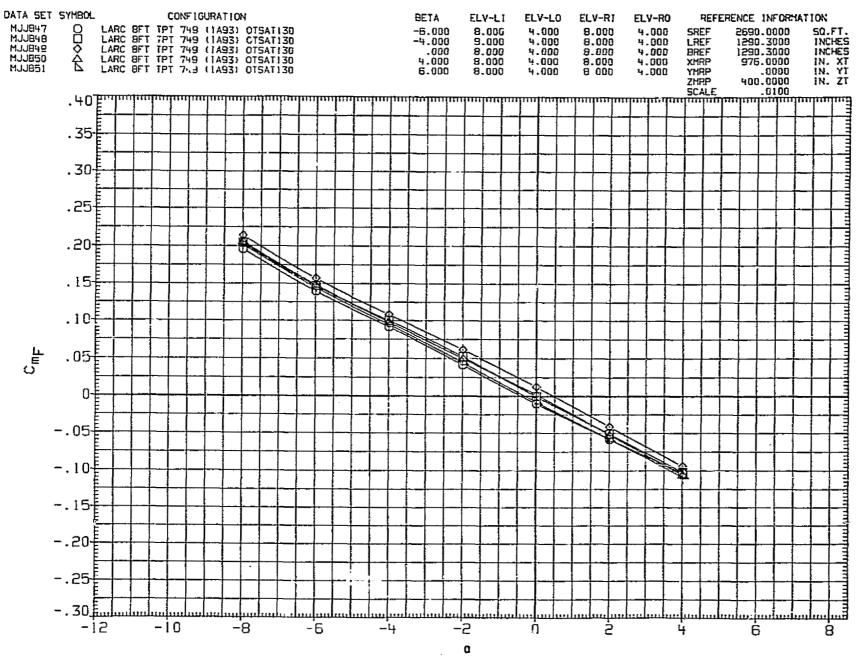


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

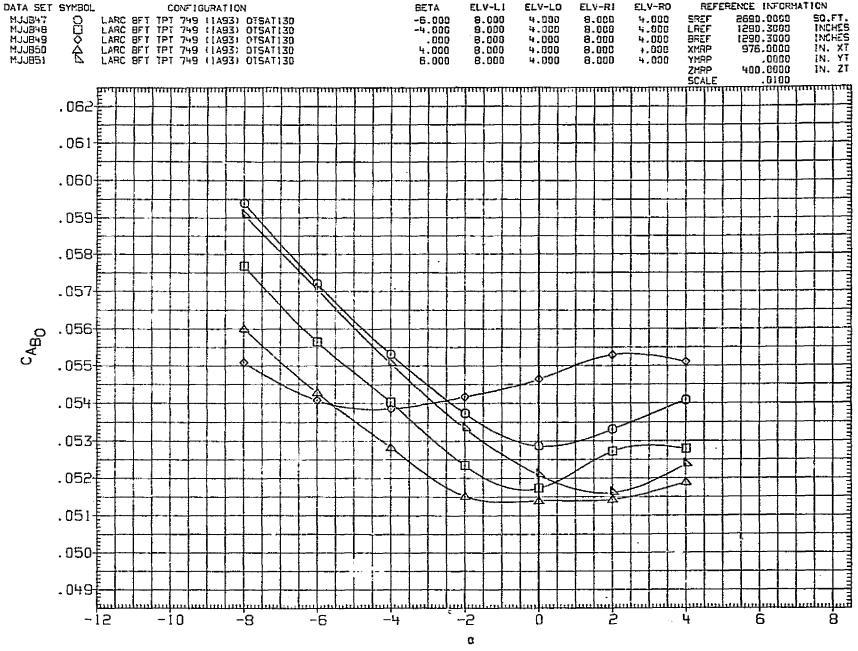


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

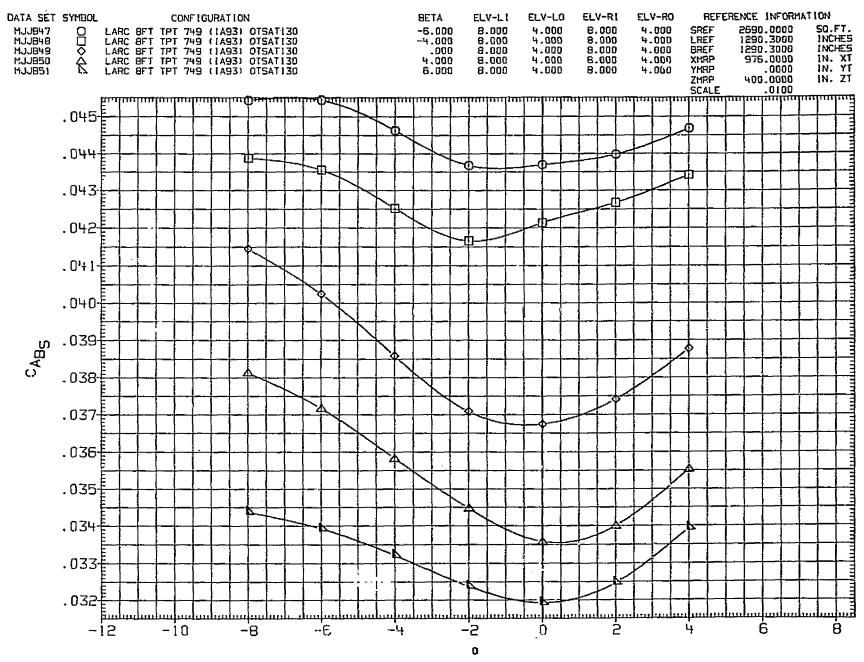


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

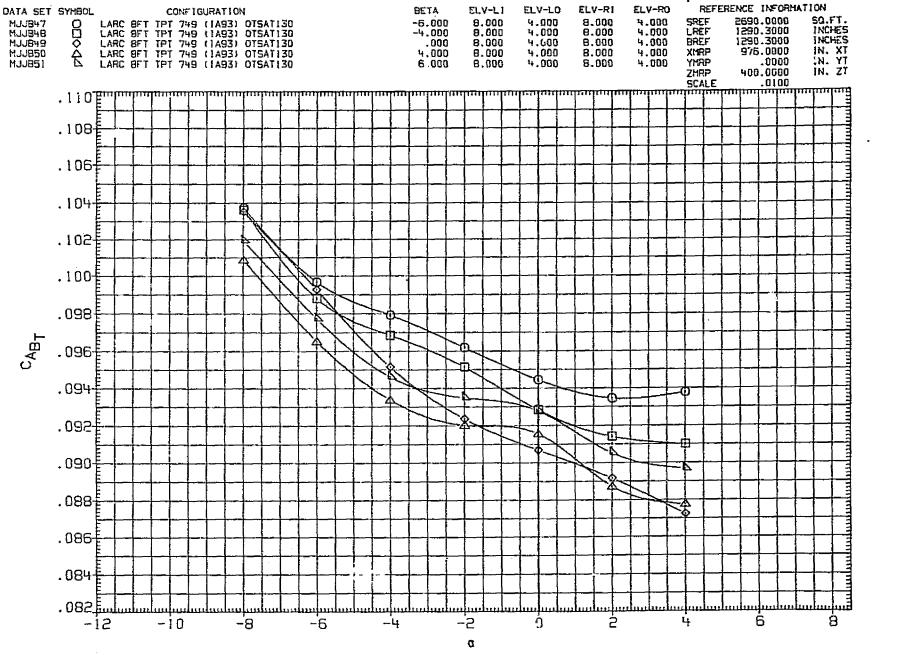


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

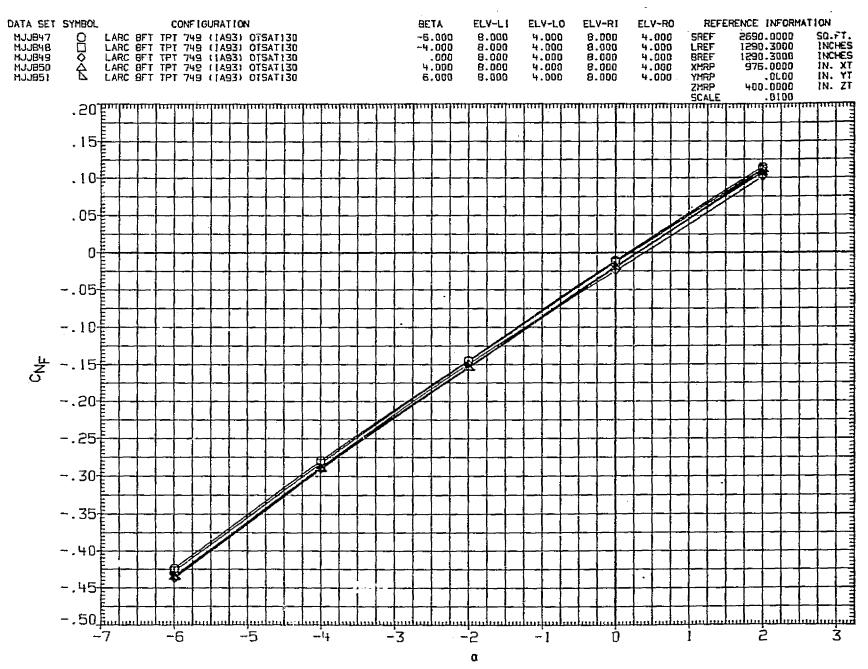


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

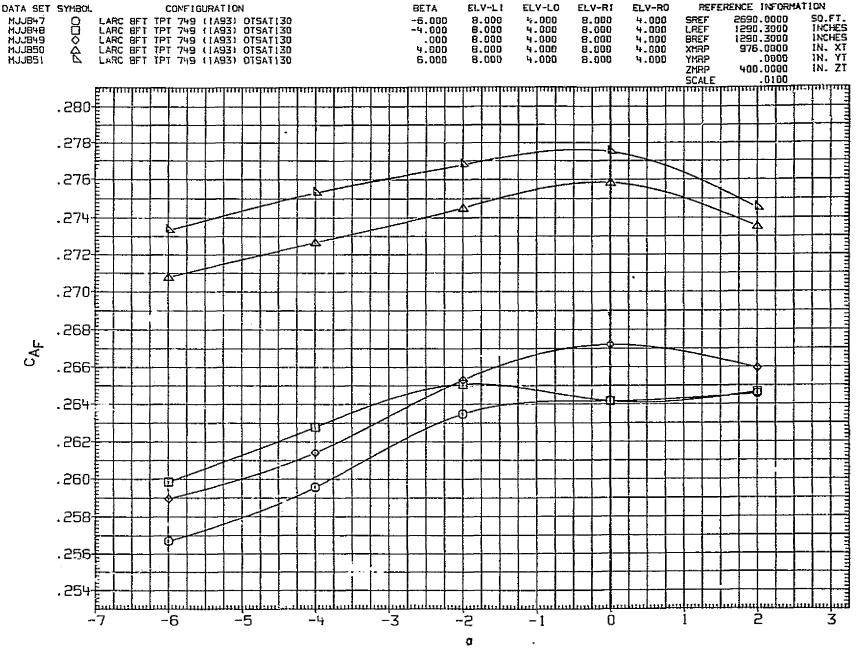


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

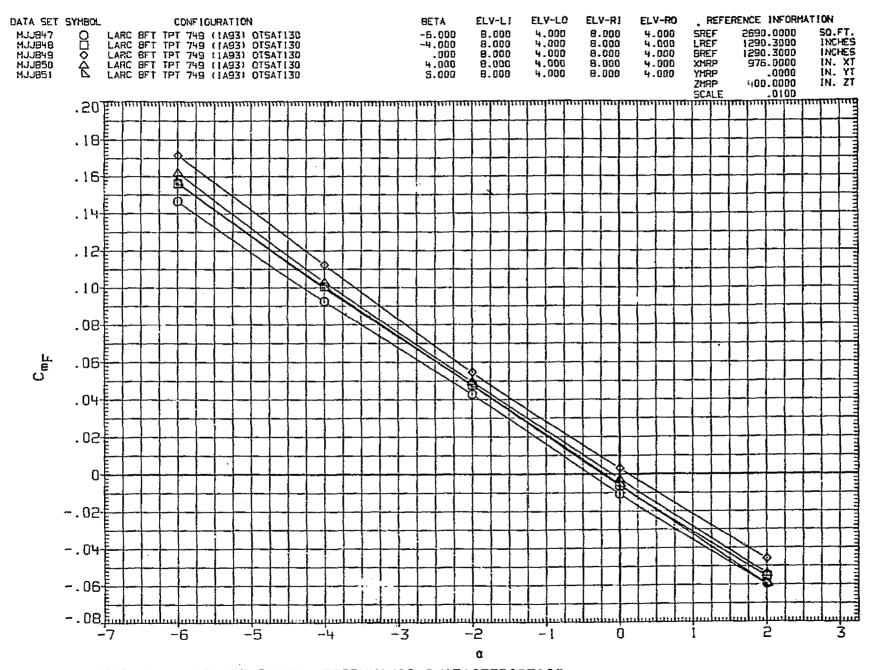


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

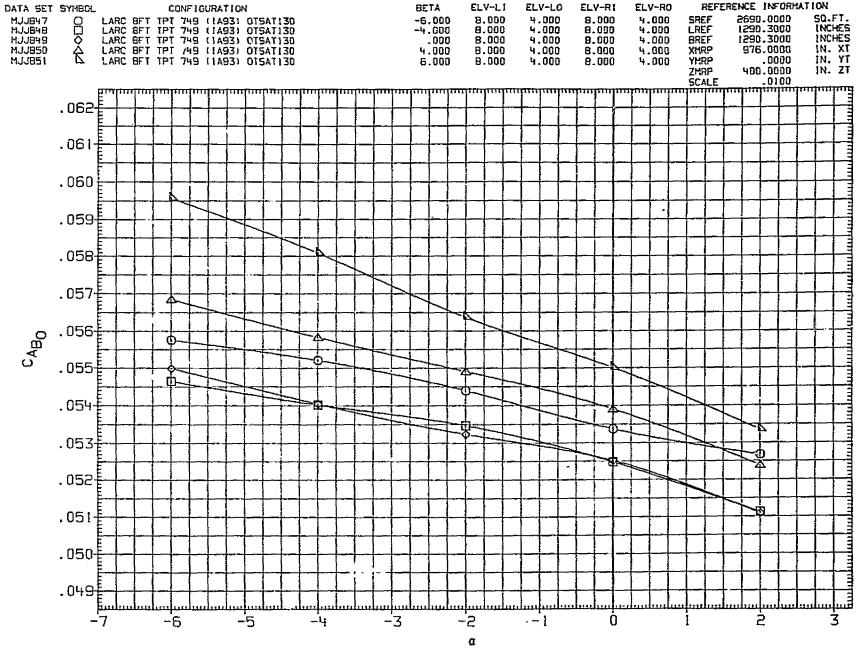


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

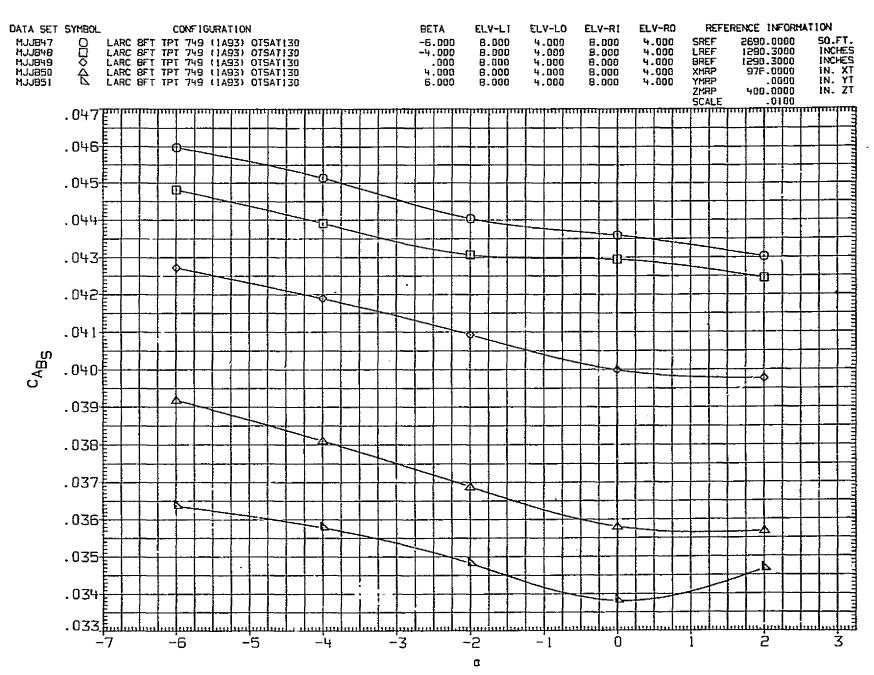


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

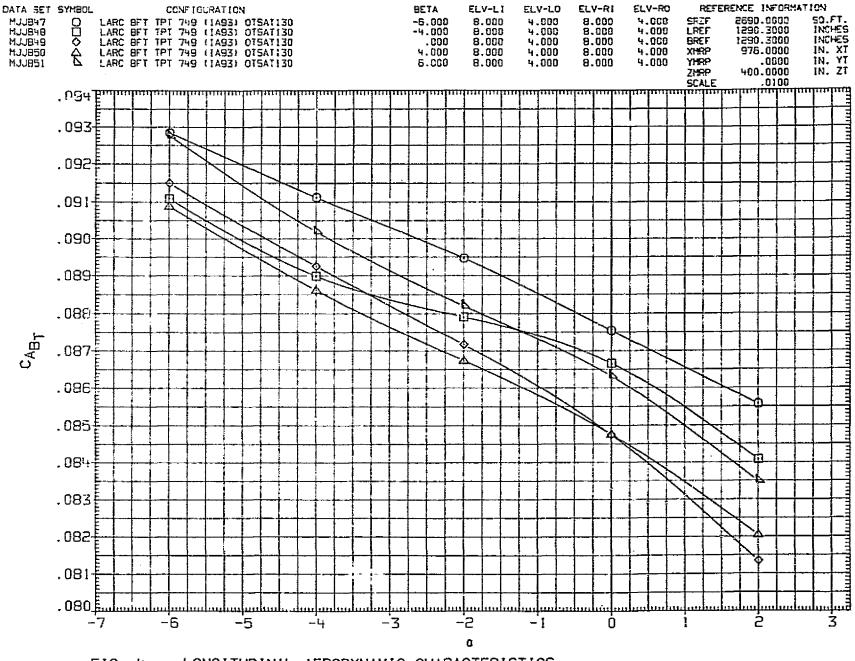


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(C) MACH = 1.15 PAGE 174

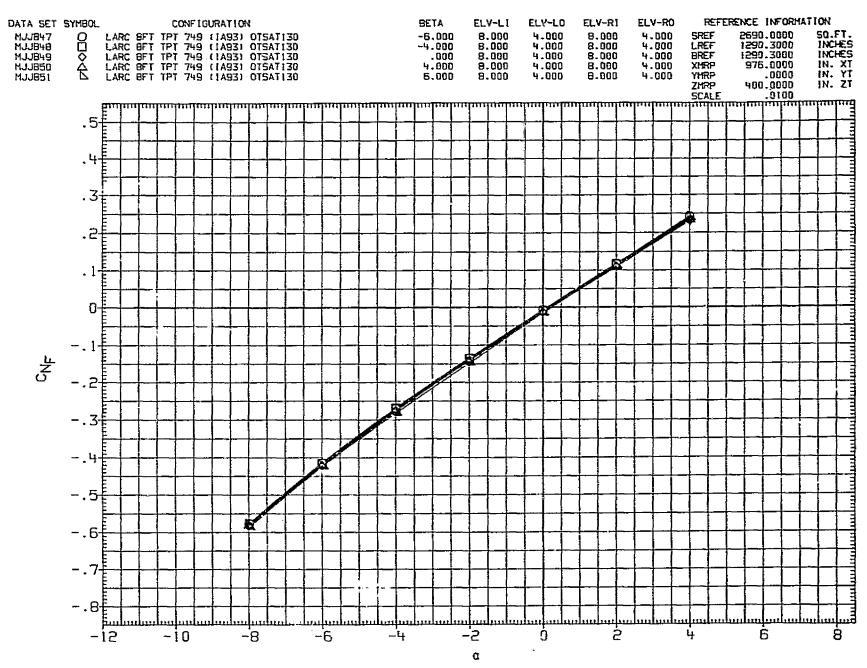


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D) MACH = 1.20 PAGE 175

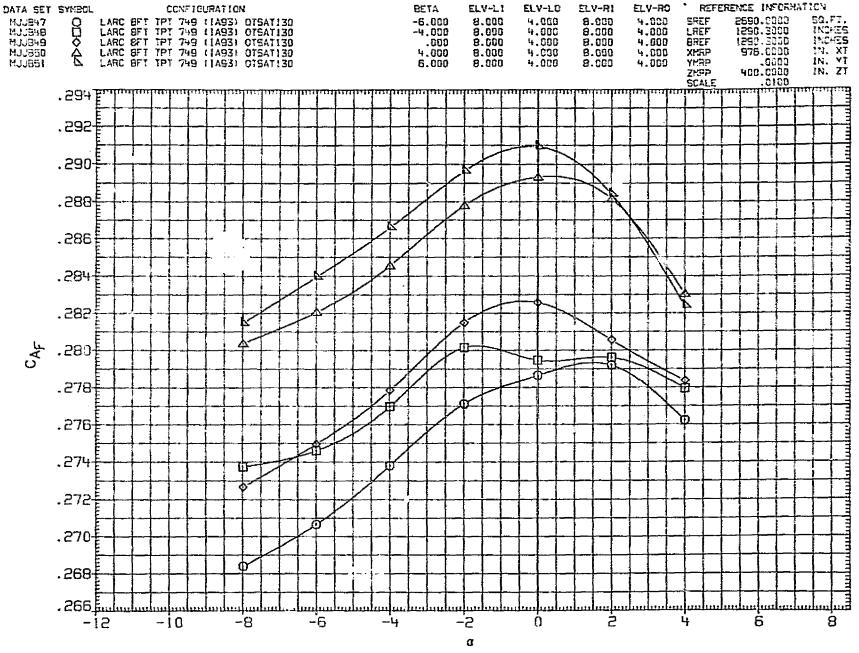


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

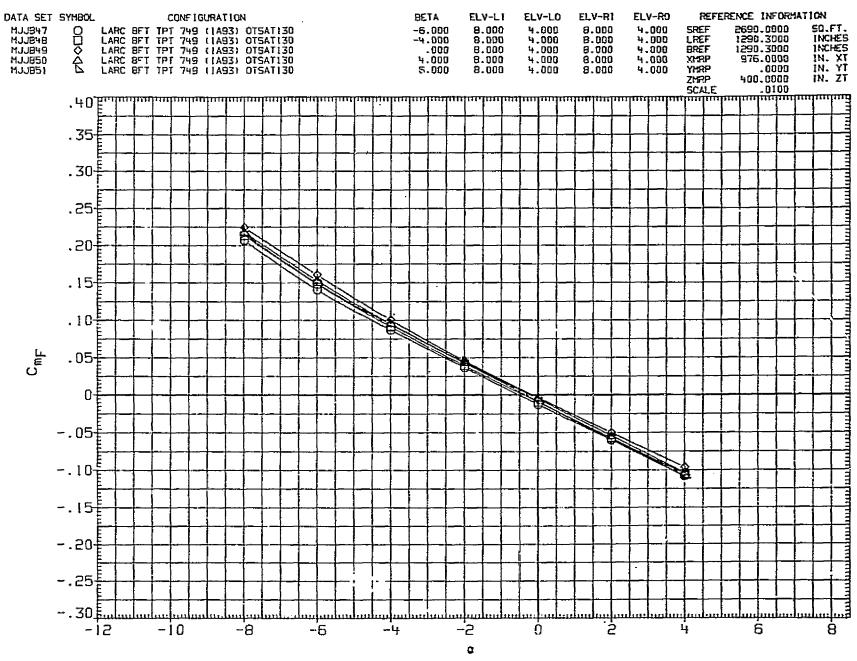


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20 PAGE 177

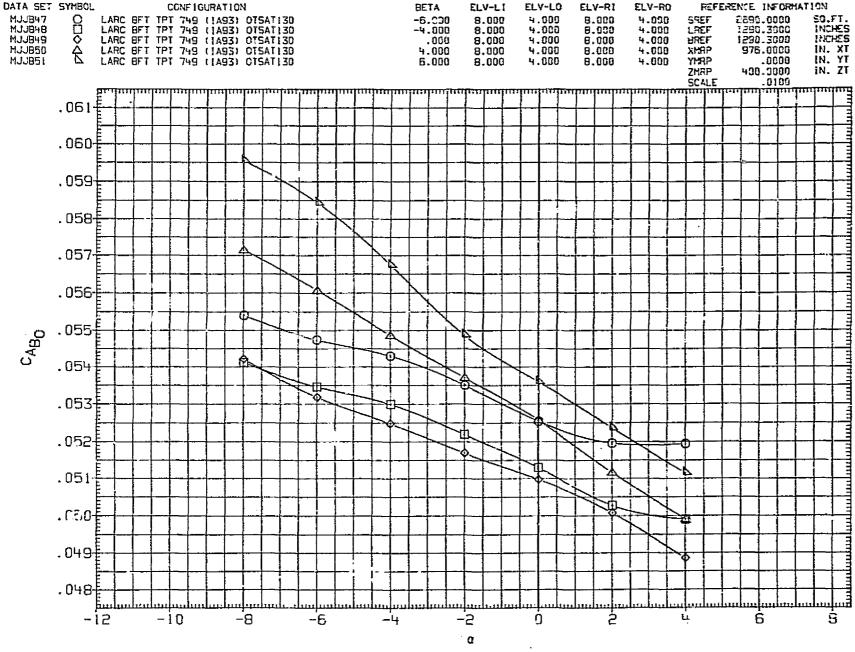


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D) MACH = 1.20 PAGE 178

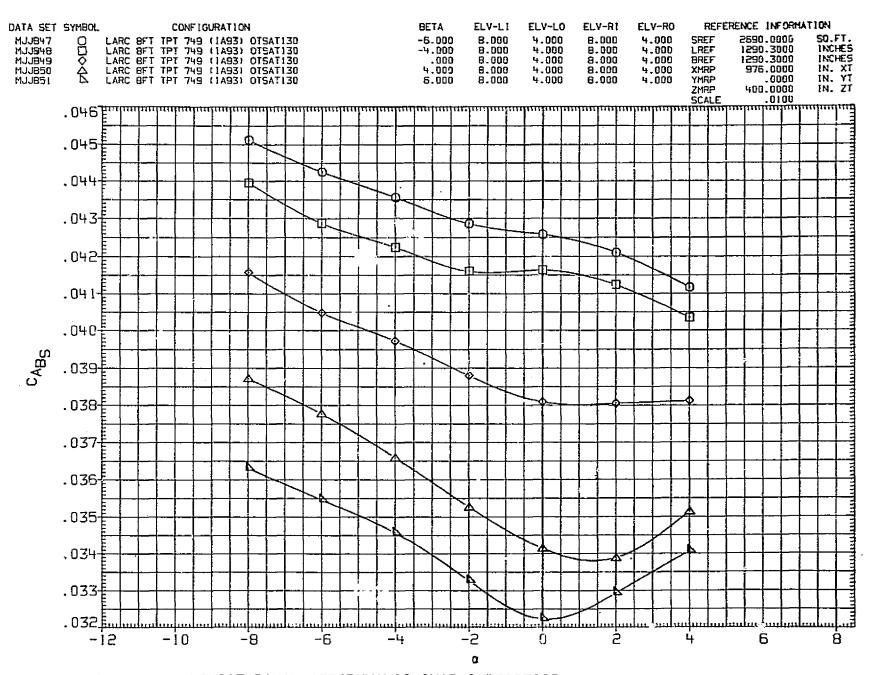


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

 $CD_{MACH} = 1.20$ PAGE

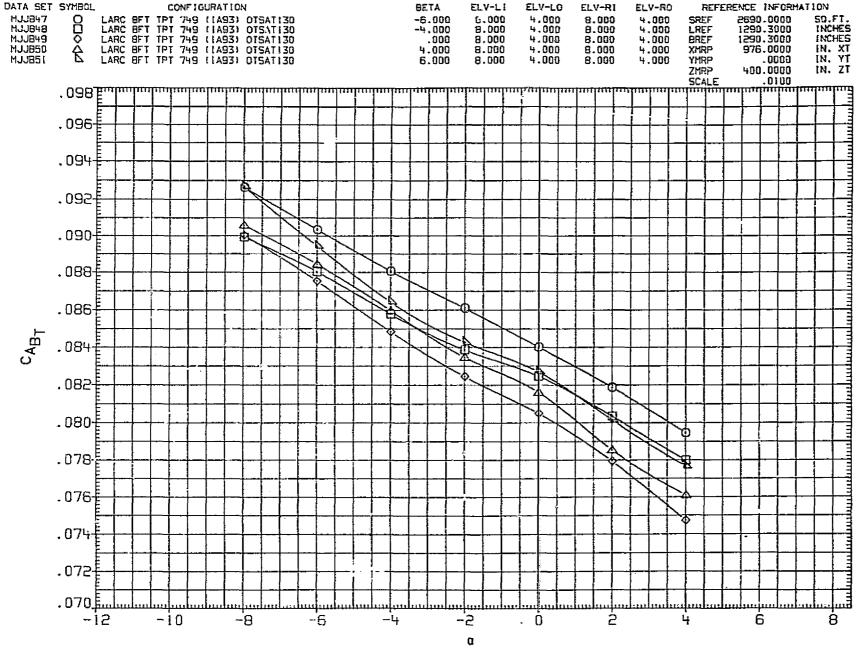


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

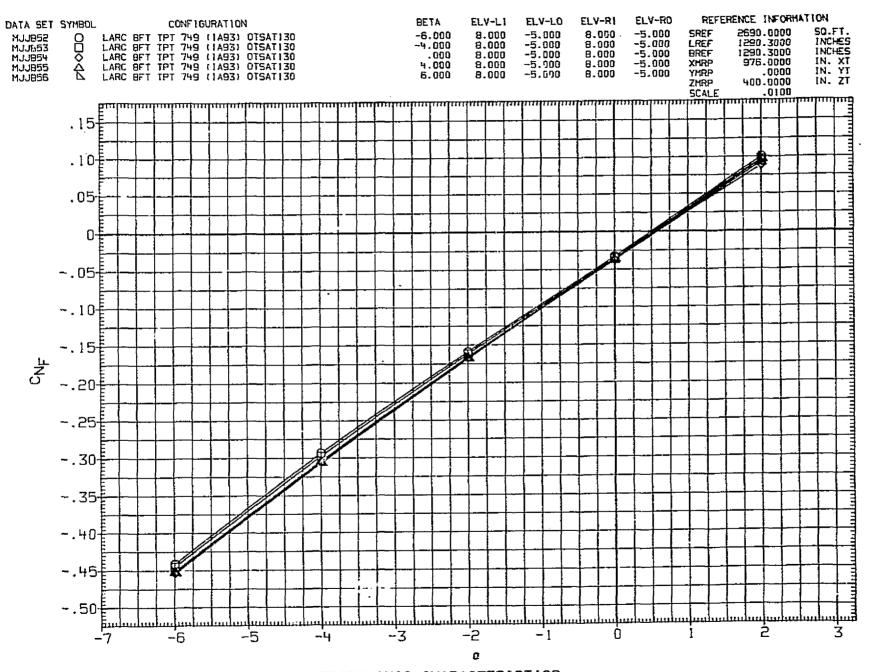


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

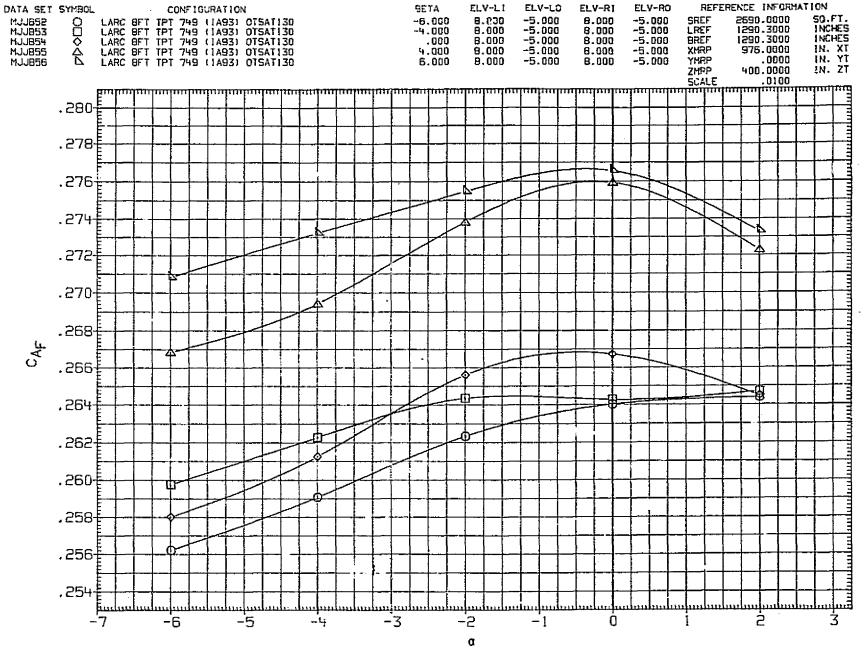


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

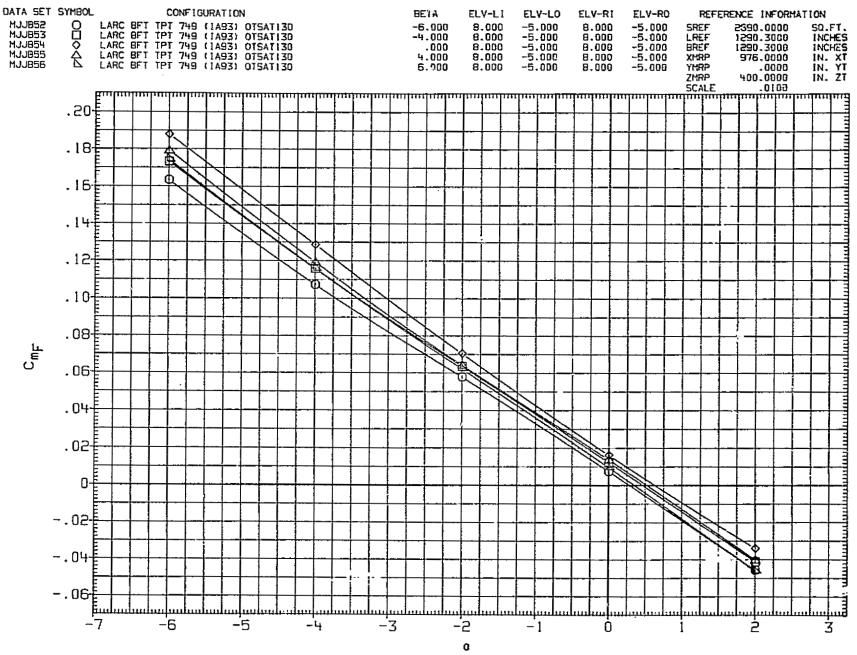
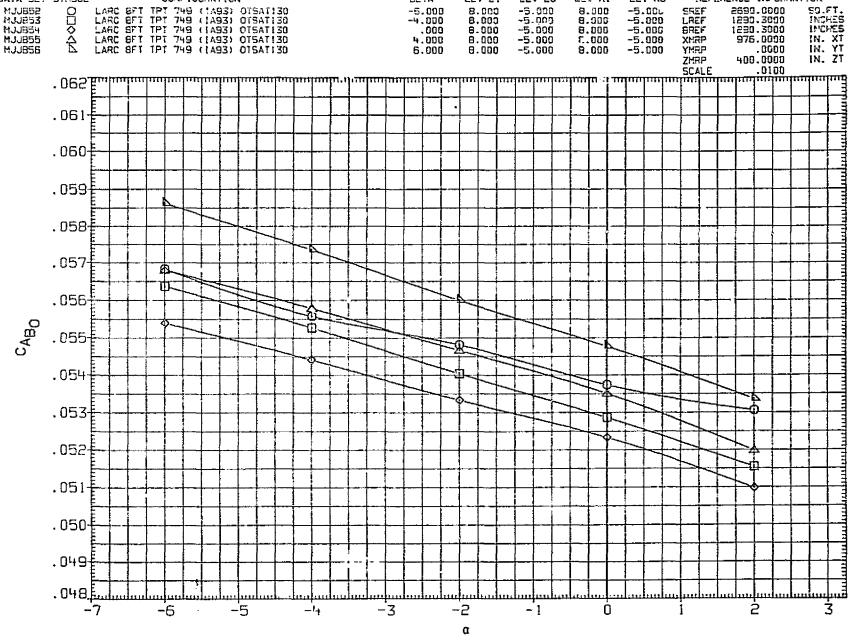


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(A)MACH = 1.15

183



BETA

ELV-LI ELV-LO

ELV-RI

ELV-R0

FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

CONFIGURATION

DATA SET SYMBOL

REFERENCE INFORMATION

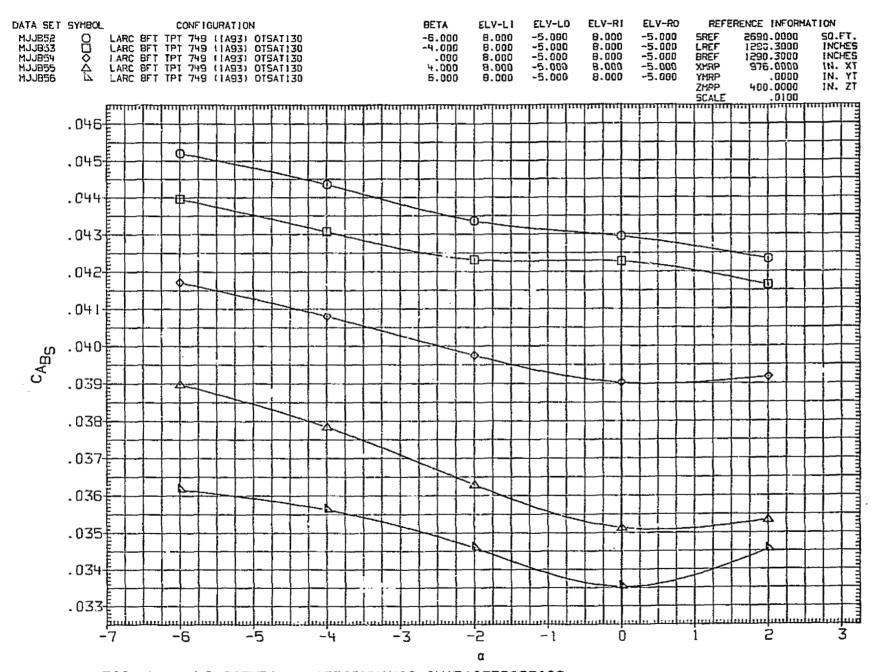
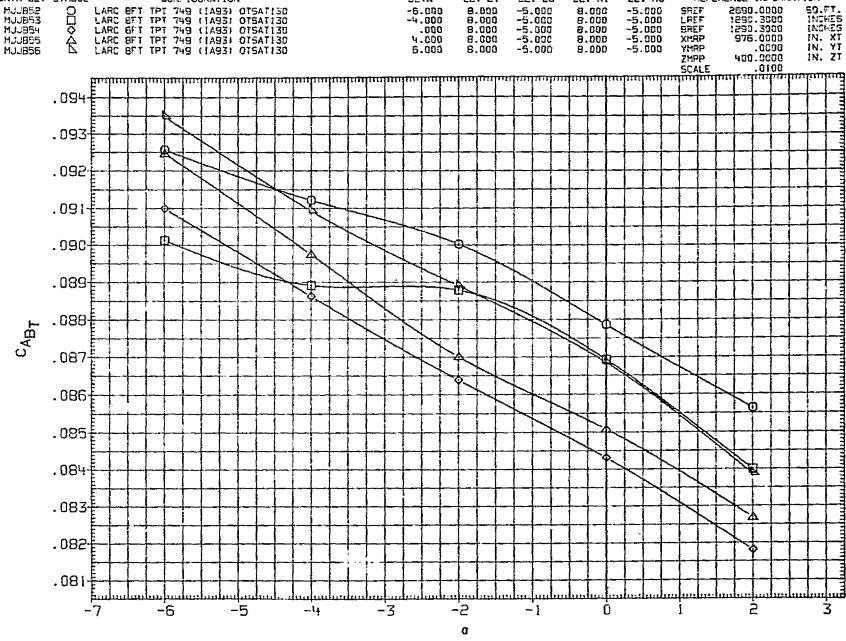


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



BETA

ELV-LI ELV-LO ELV-RI

ELV-RO

REFERENCE INFORMATION

FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

DATA SET SYMBOL

CONFIGURATION

186

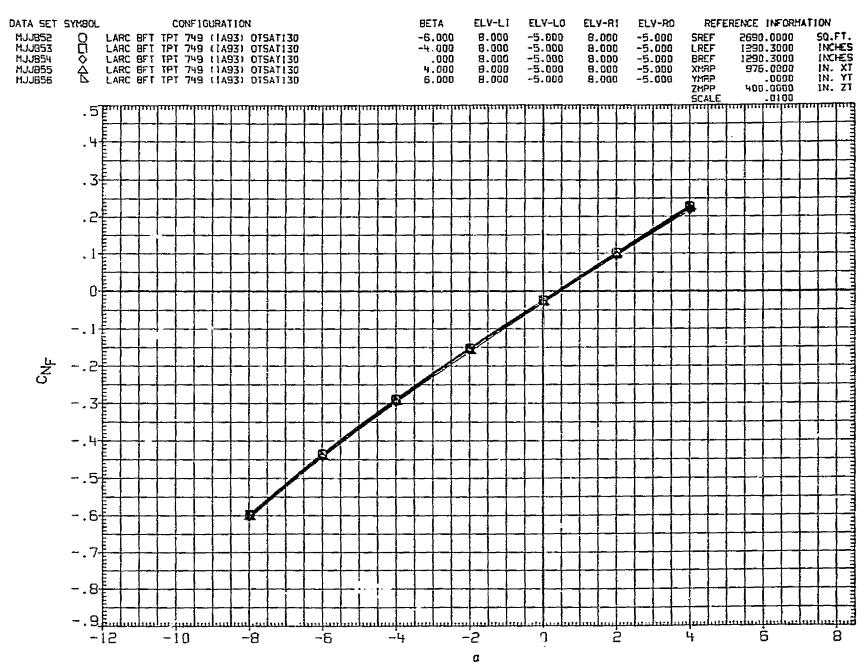


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

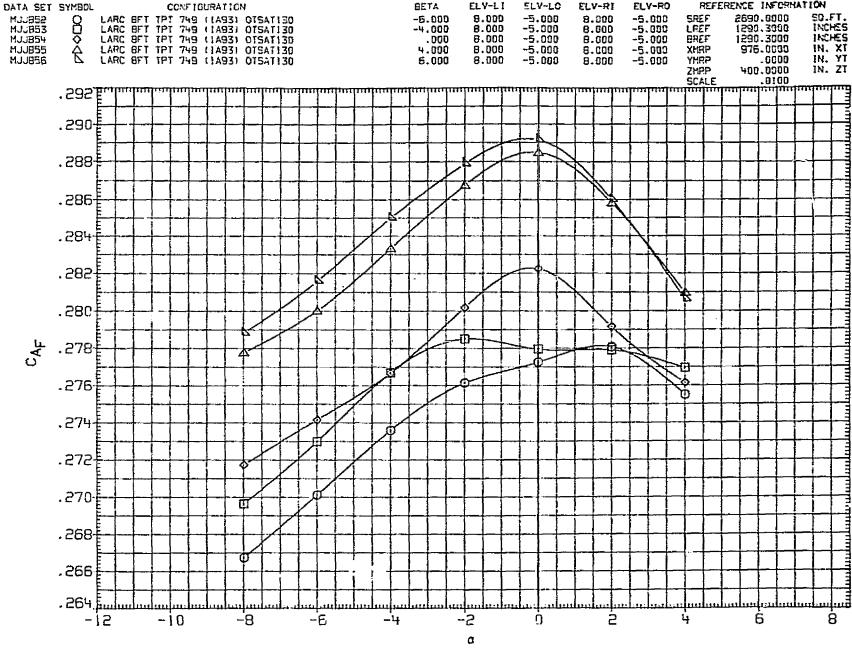


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

REFERENCE INFORMATION

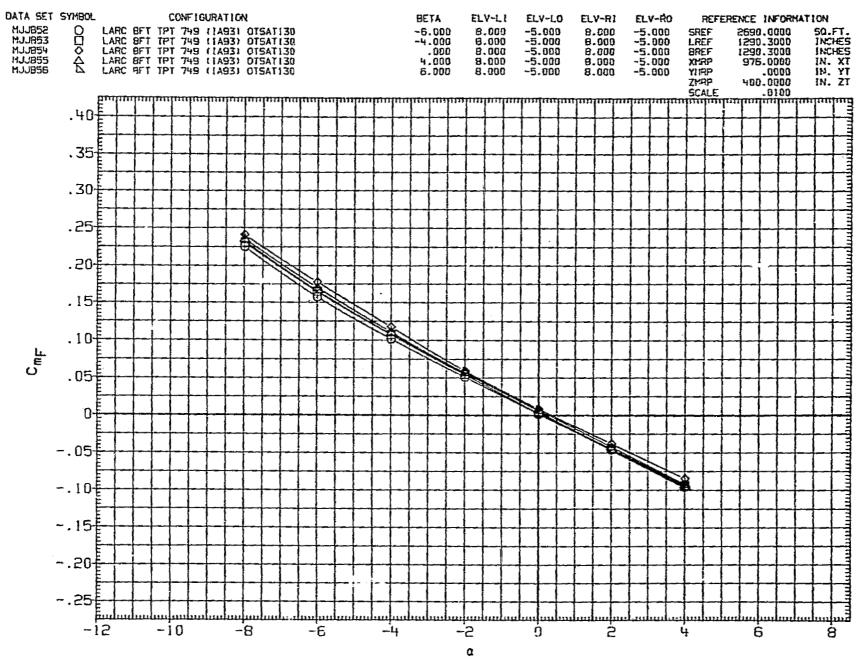


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B)MACH = 1.20

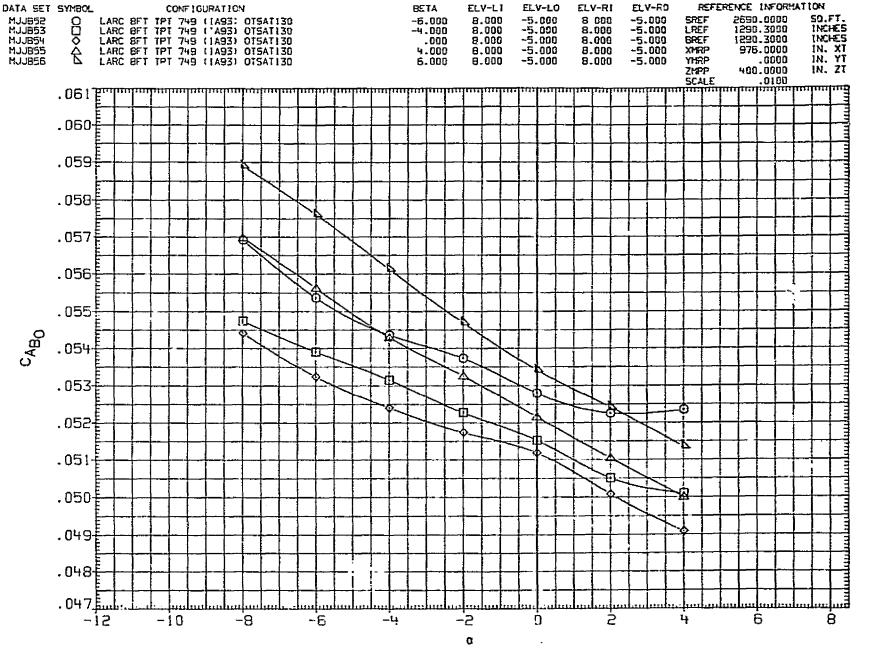


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

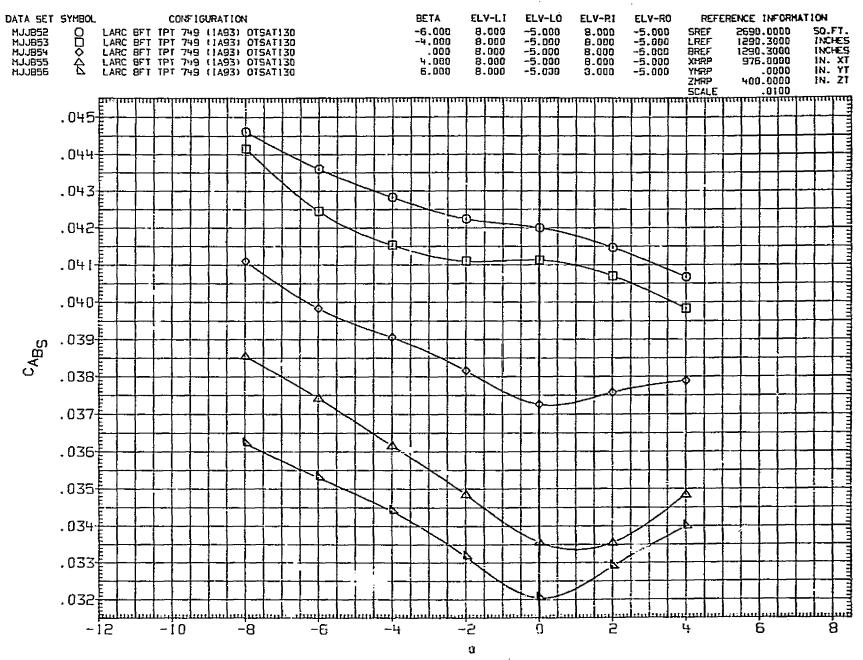


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

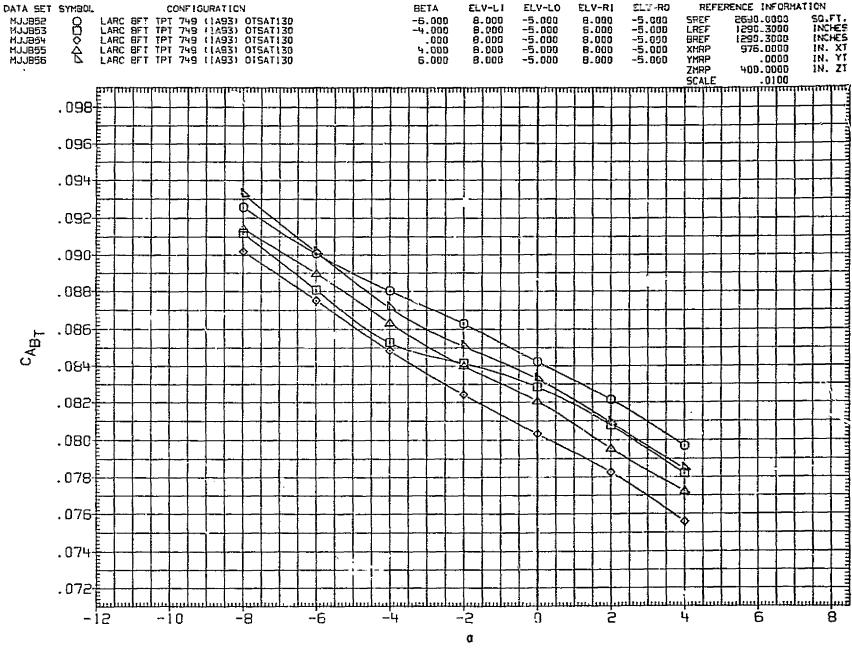


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B) MACH = 1.20 PAGE 192

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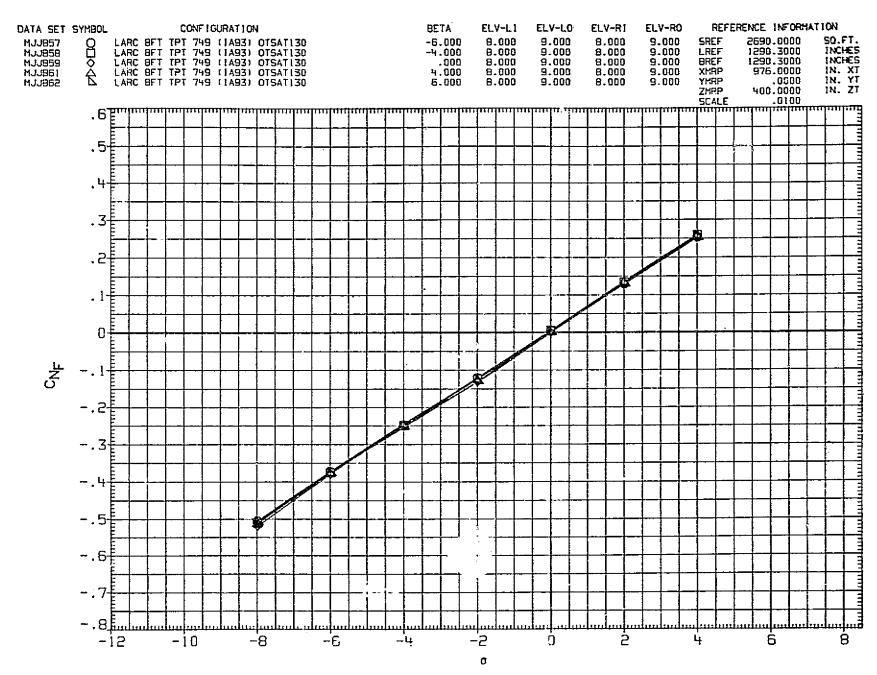


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

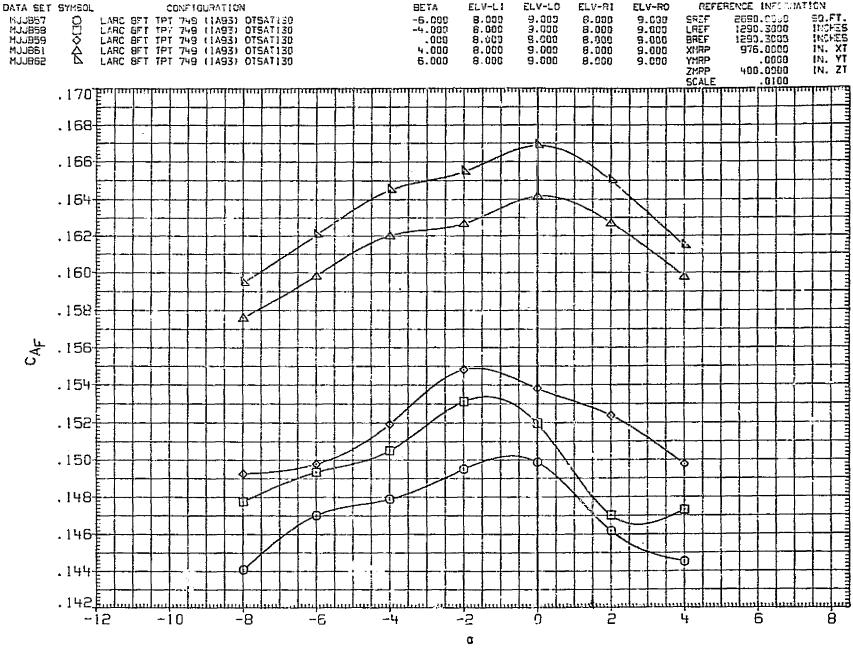


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

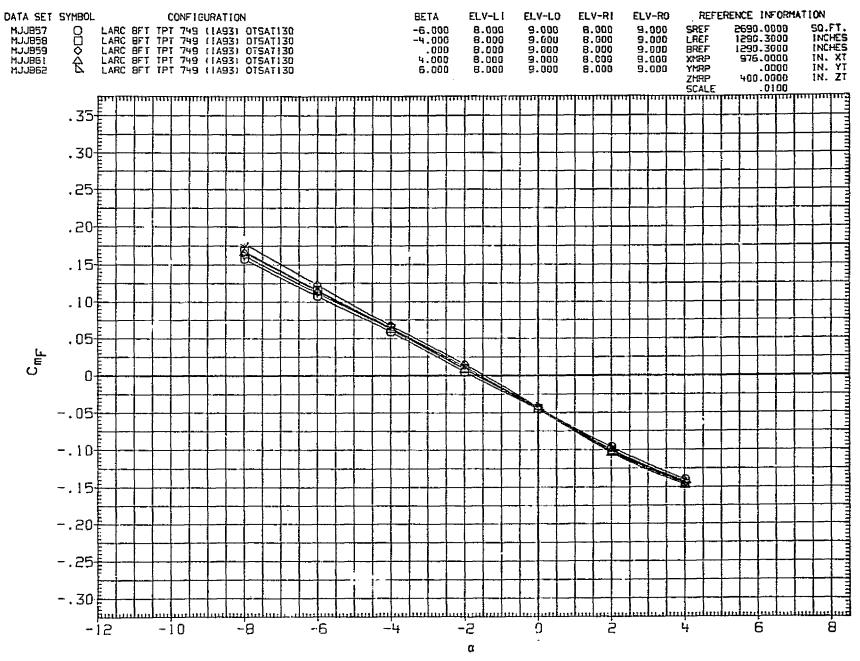


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

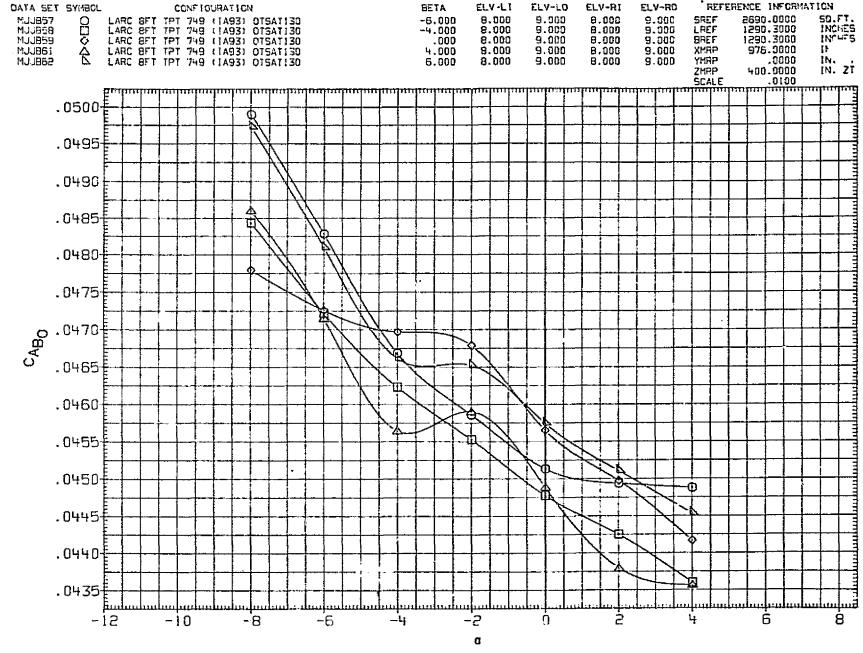


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

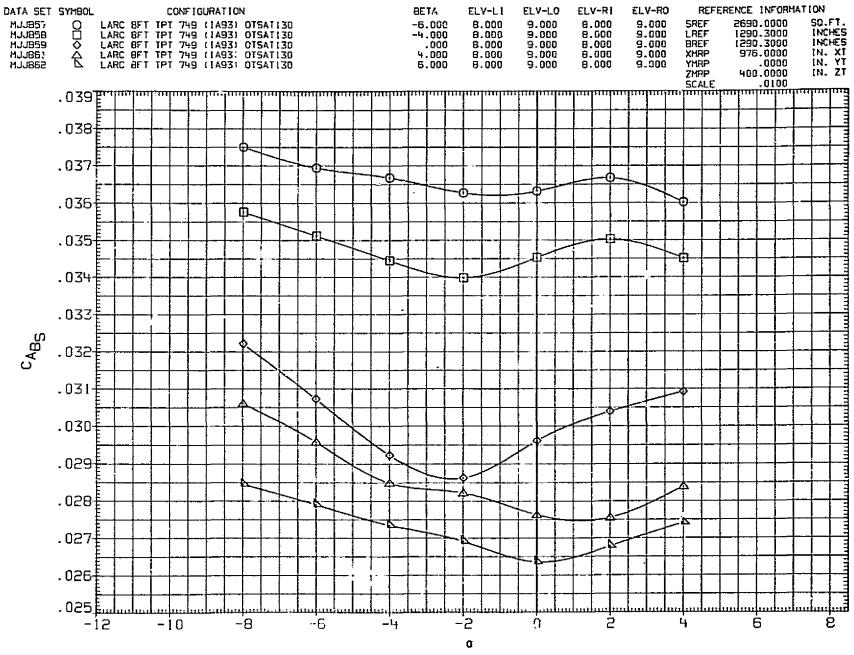


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

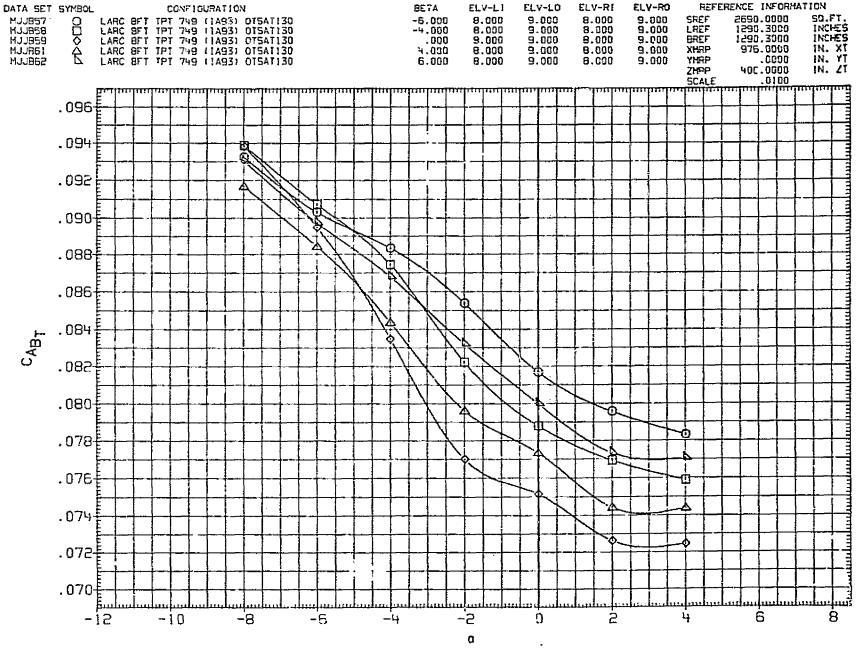


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

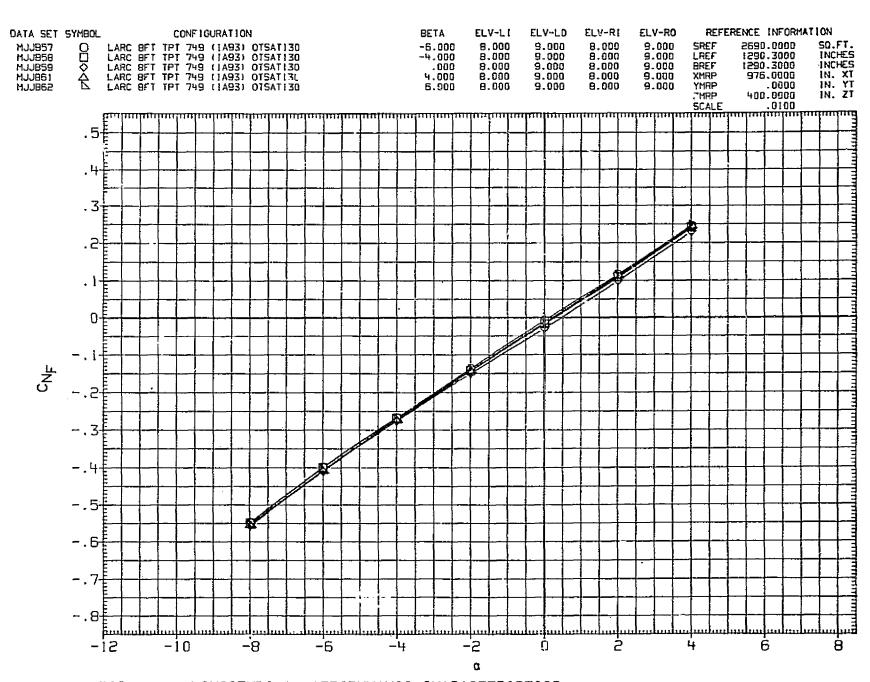


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

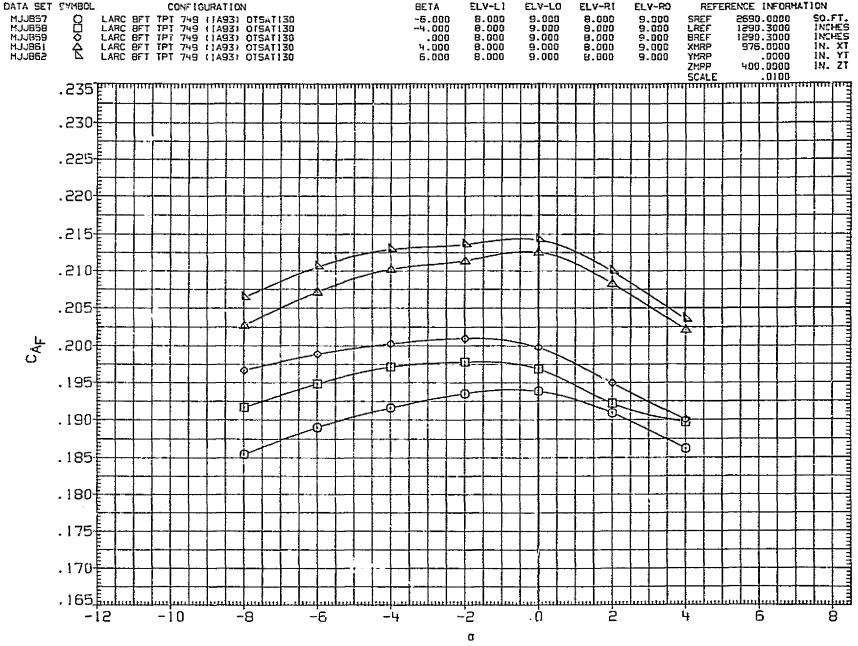


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B)MACH = .98

500

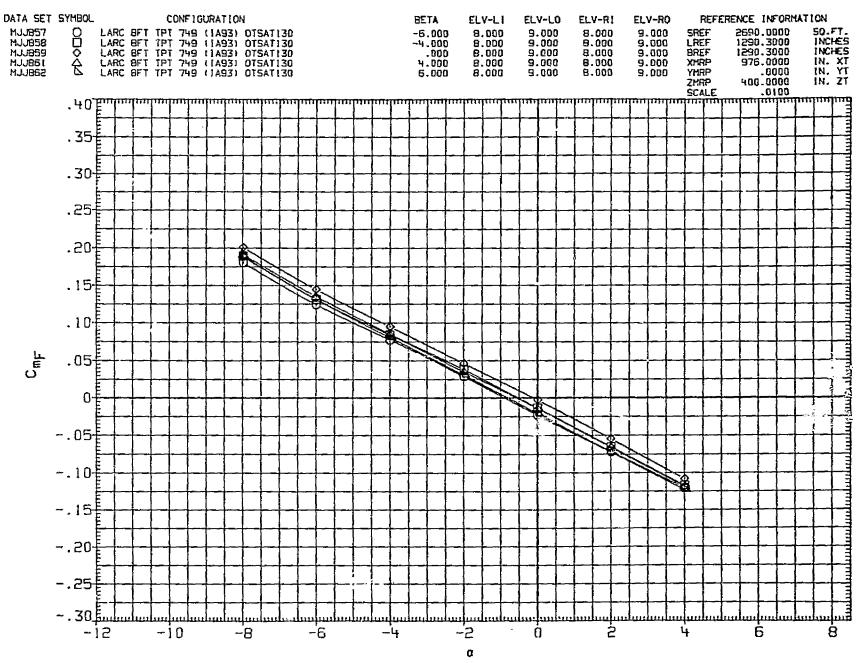


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

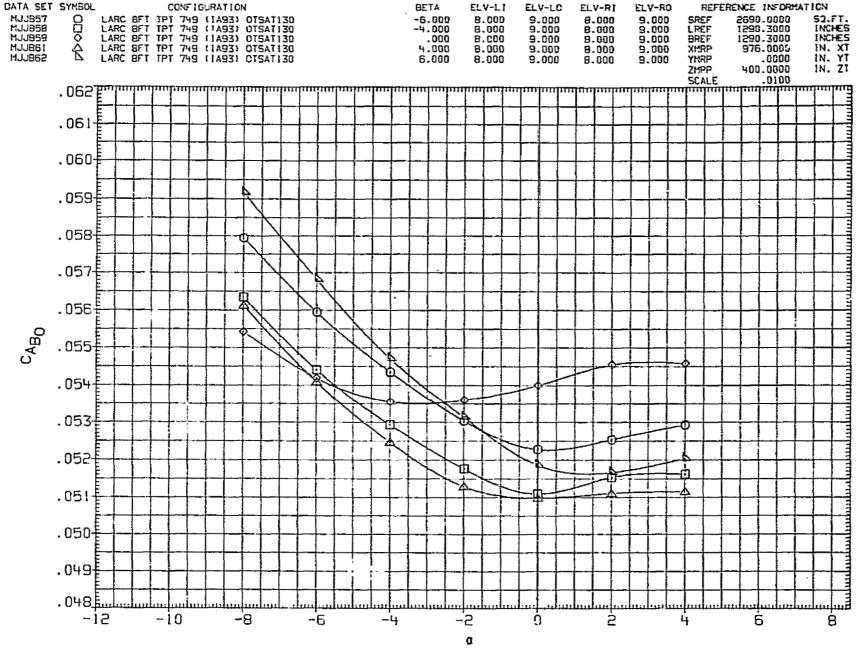


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

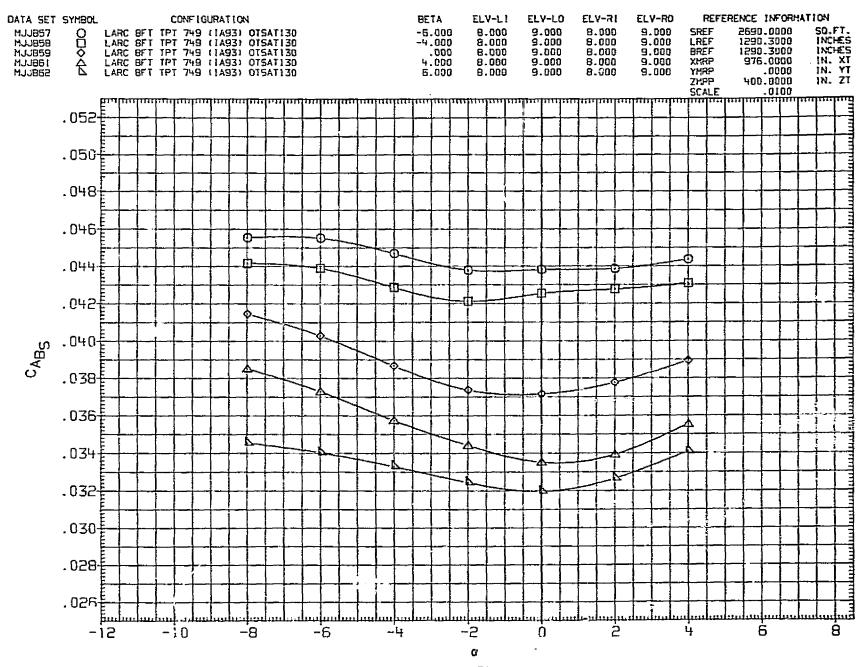


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

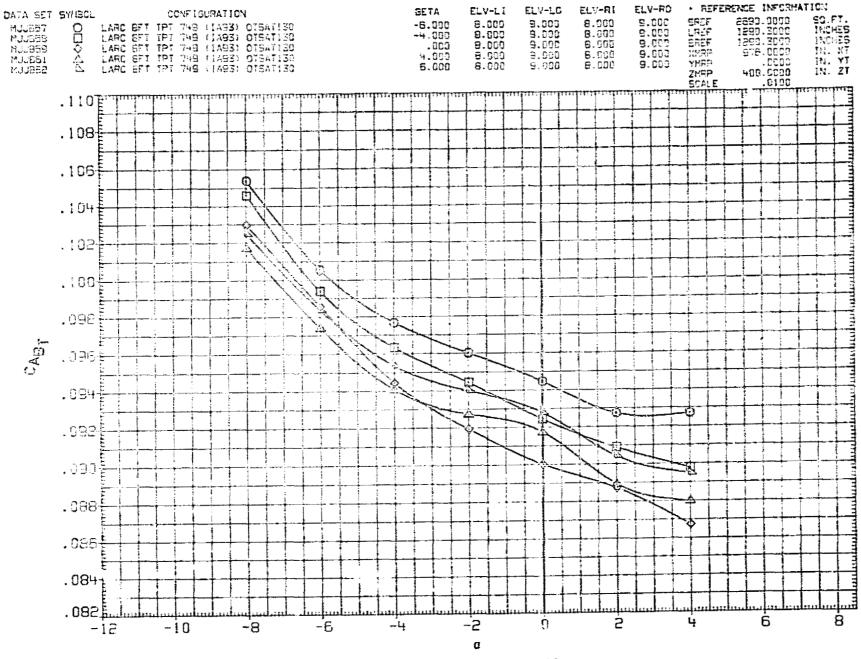


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(B) MACH = .98

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REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR 204

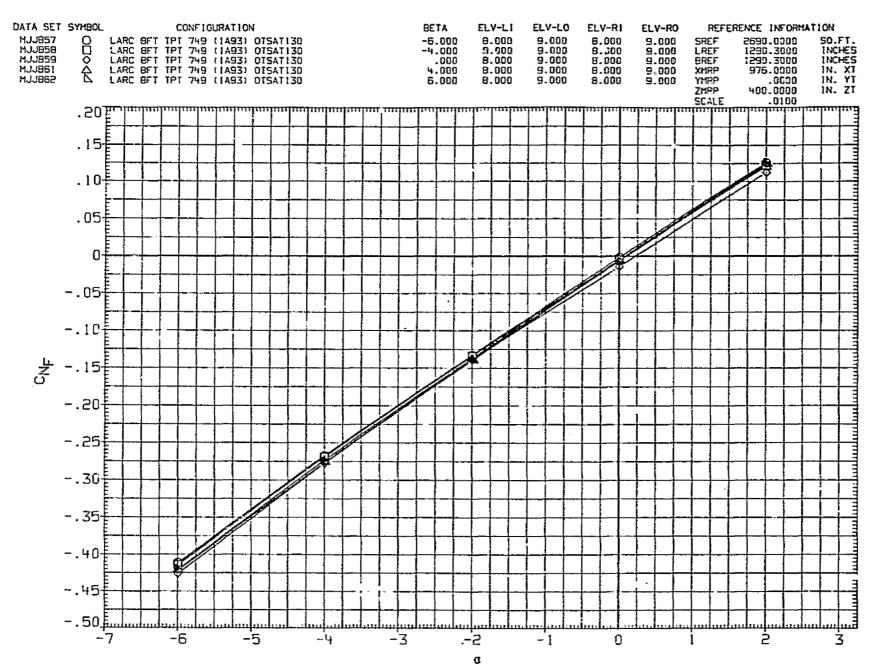


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(C)MACH = 1.15

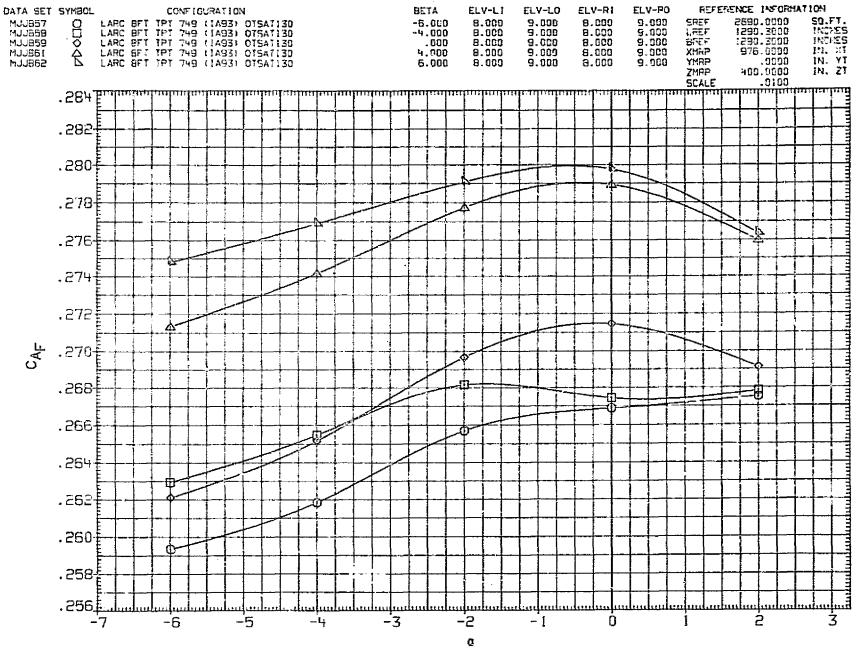


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

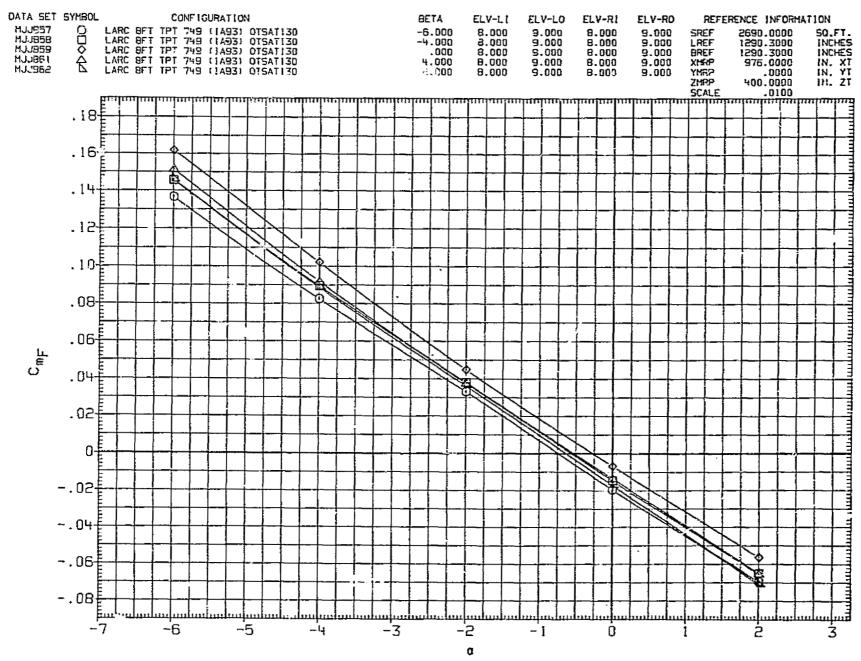


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(C)MACH = 1.15

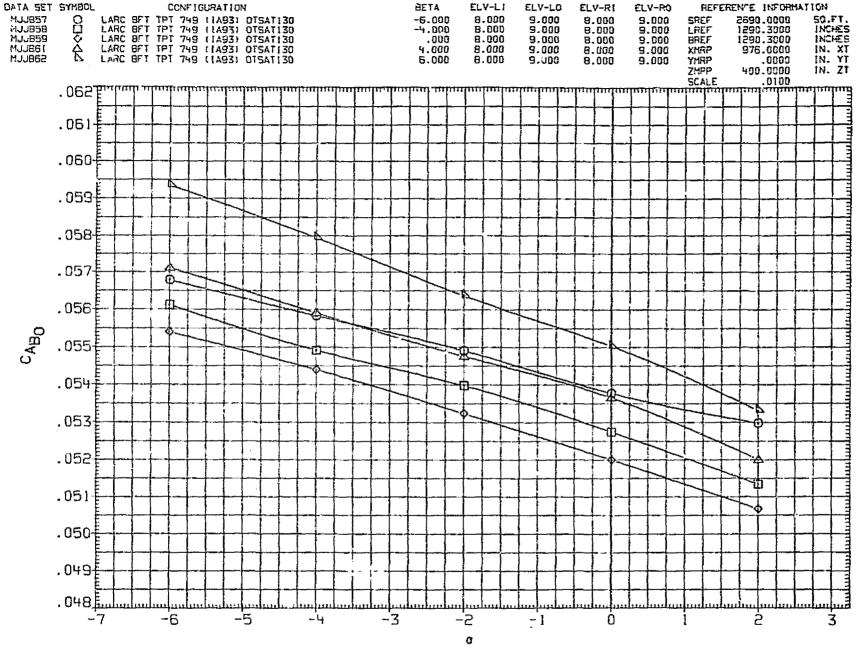


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

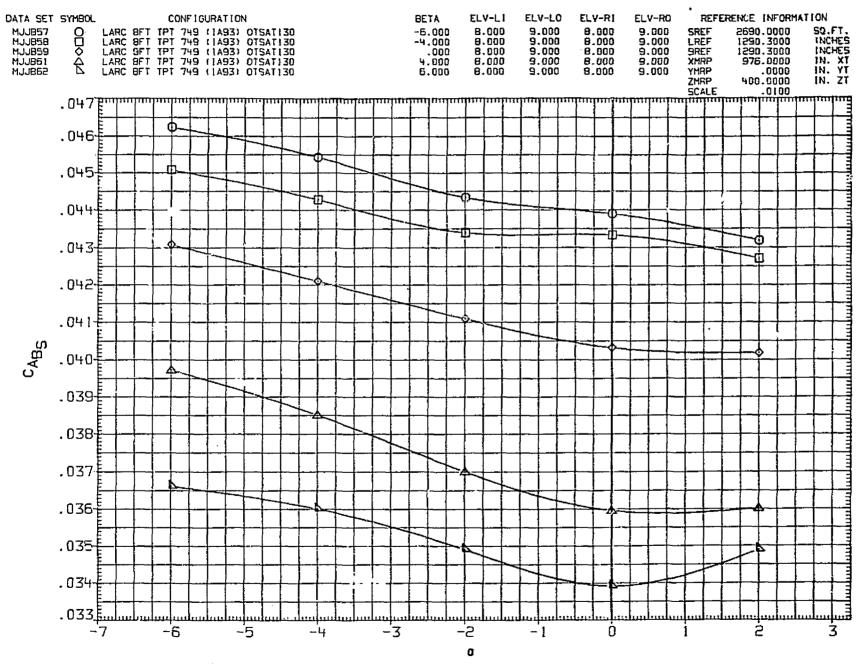


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

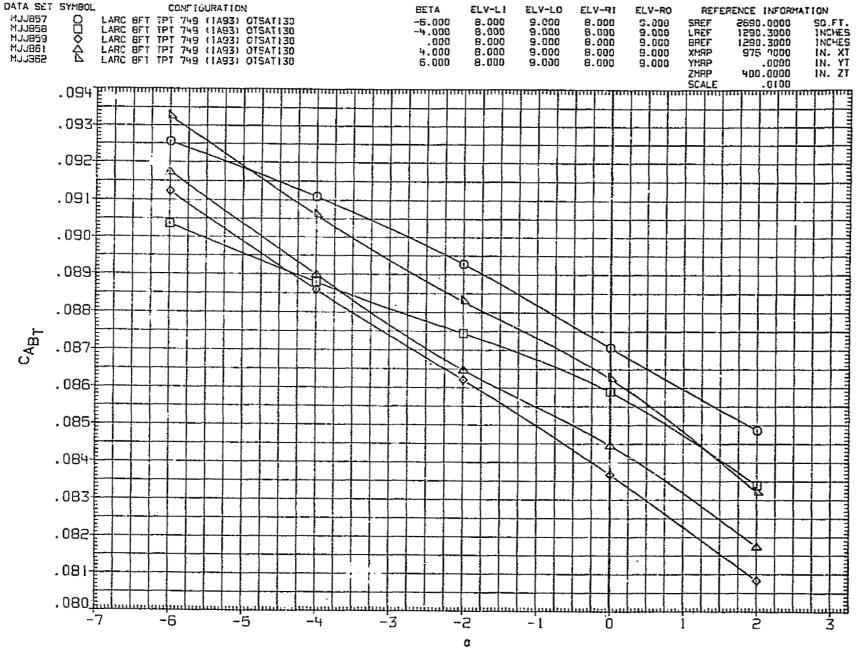


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

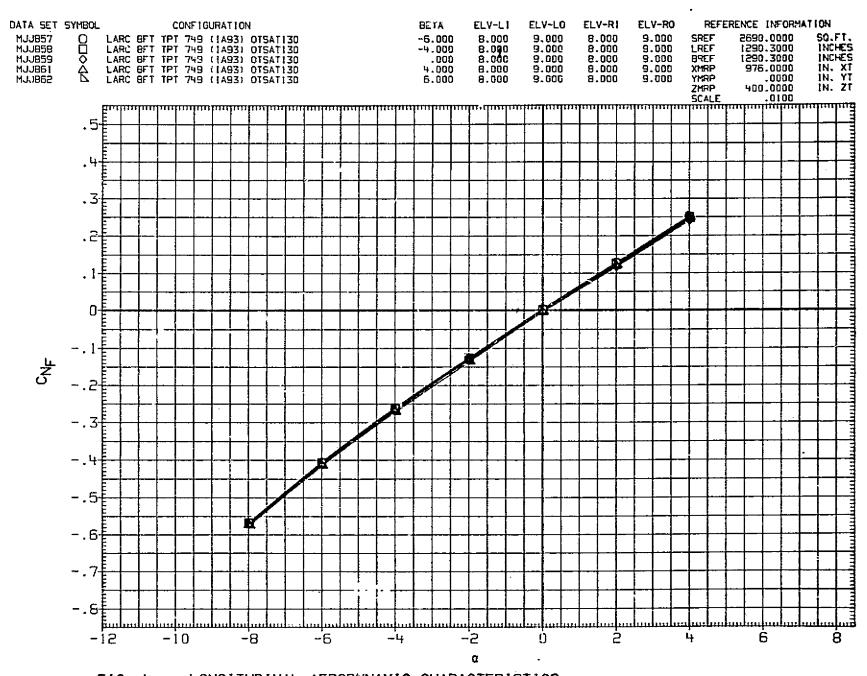


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

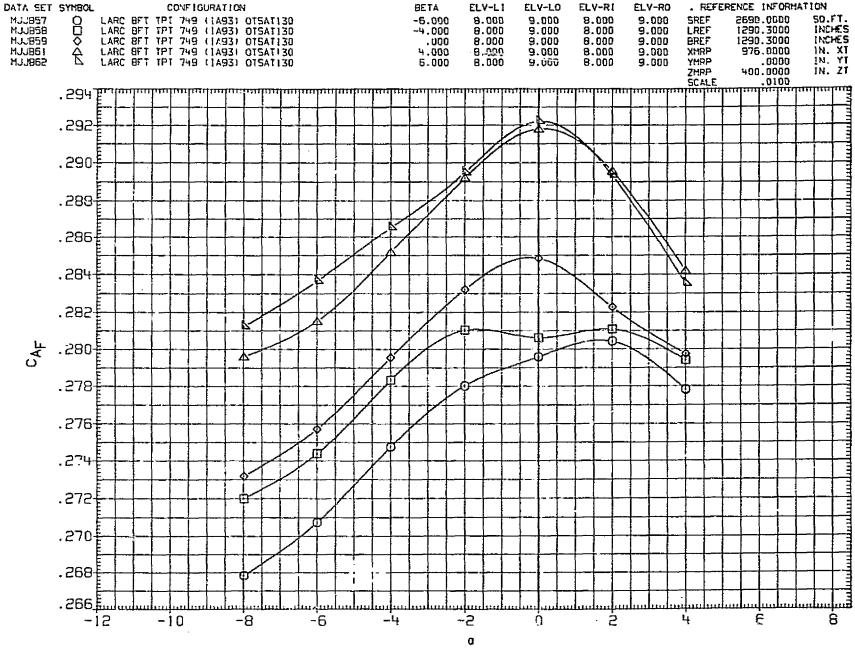


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

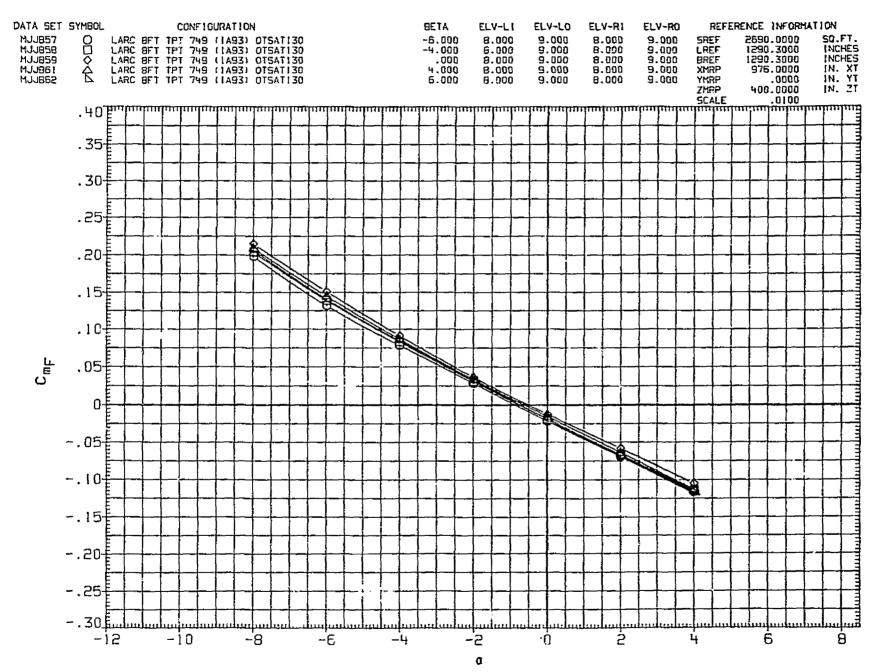


FIG. 4 LONGITUDINAL AERODYNAHIC CHARACTERISTICS

(D)MACH = 1.20

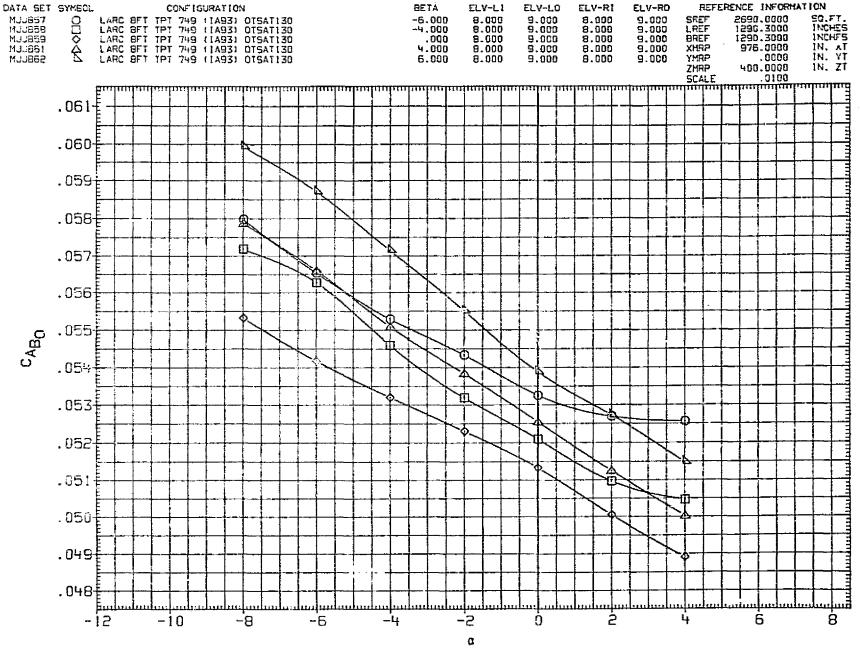


FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

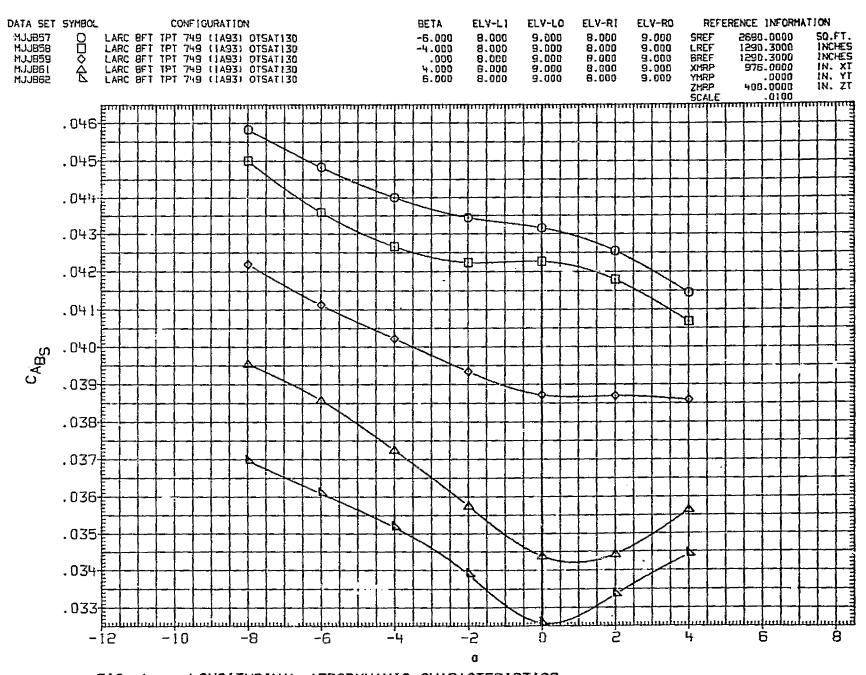


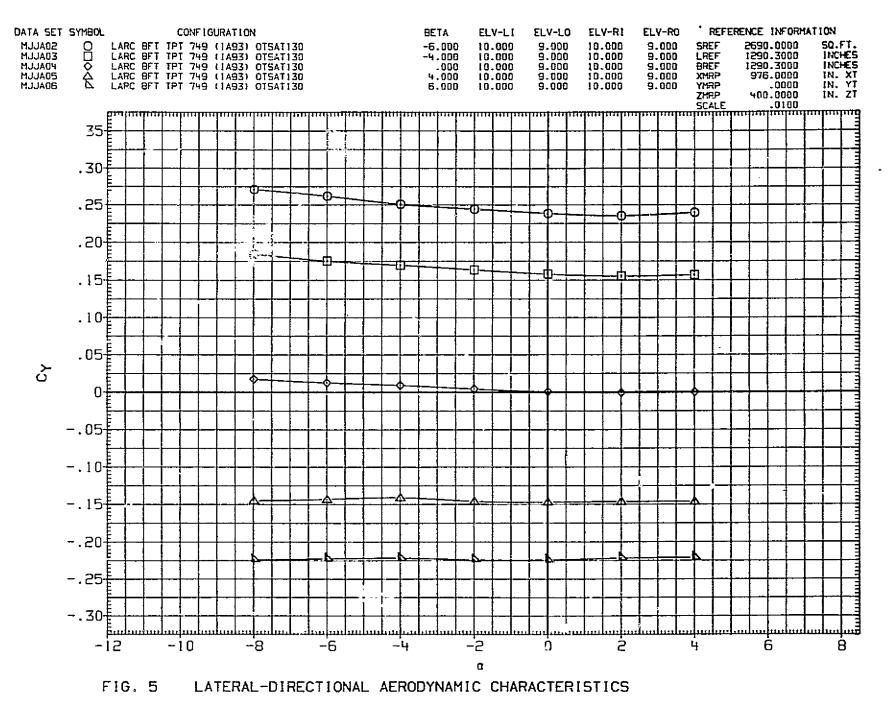
FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS



FIG. 4 LONGITUDINAL AERODYNAMIC CHARACTERISTICS

(D) MACH = 1.20 PAGE 216

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(A) MACH = .90 PAGE 217

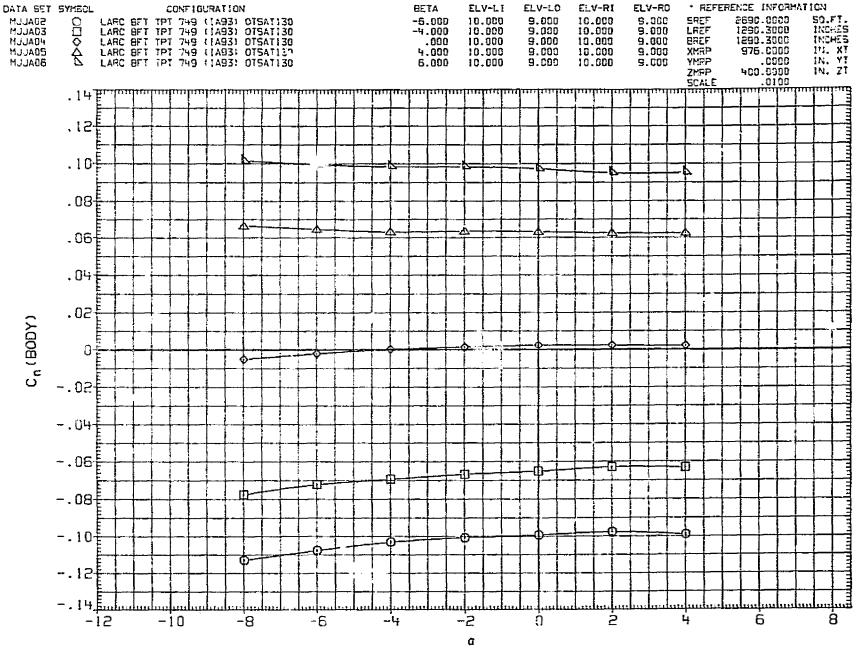


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

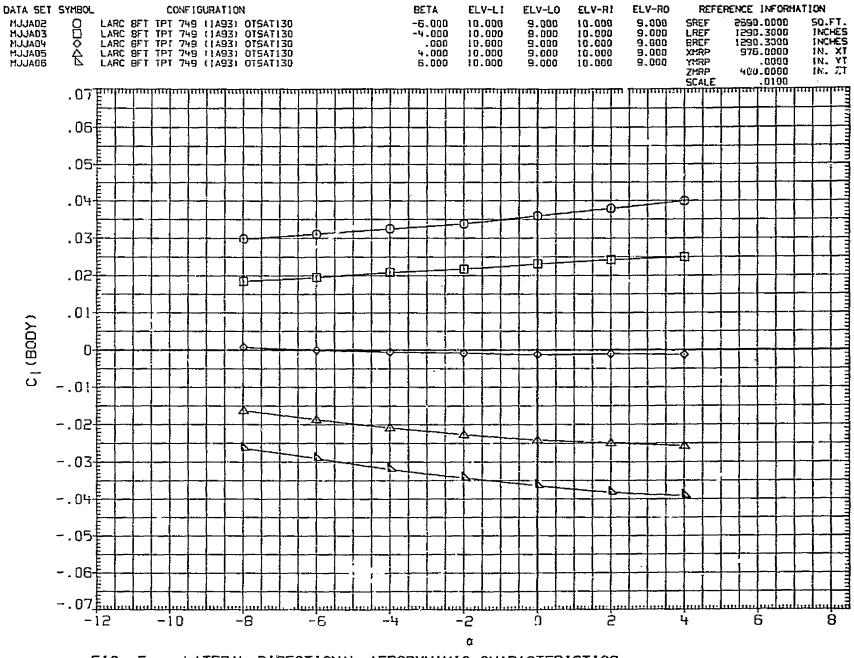


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

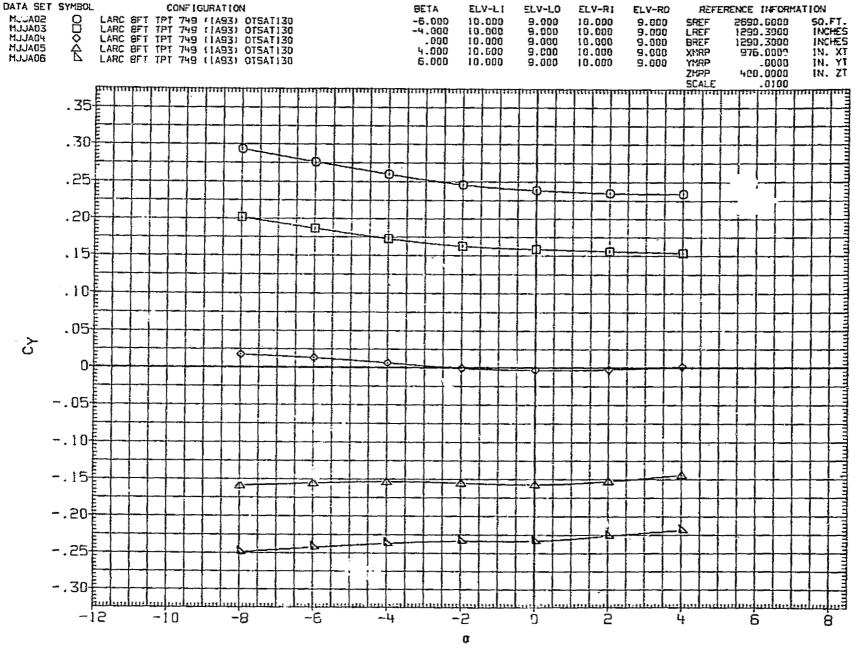


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B)MACH = .98

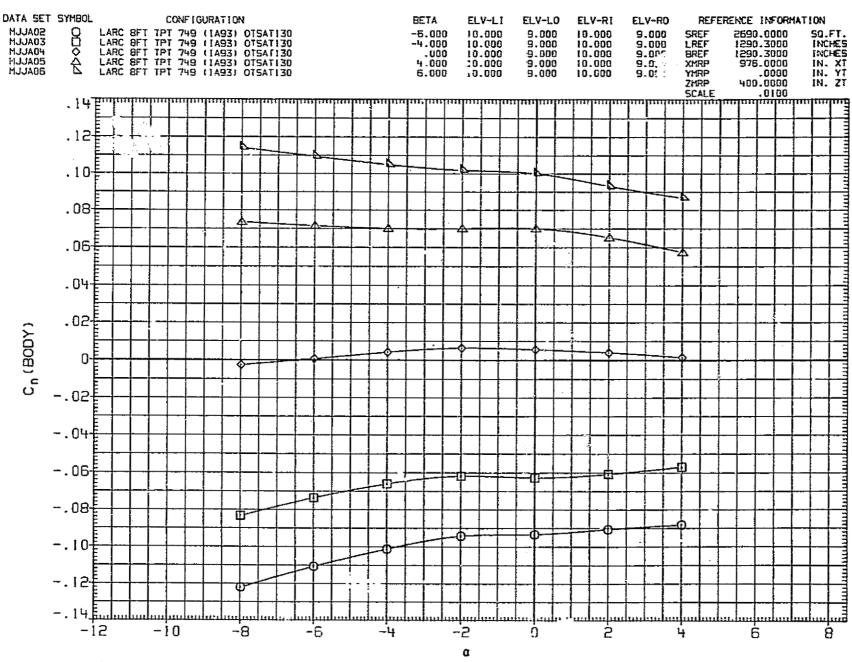


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B)MACH = .98

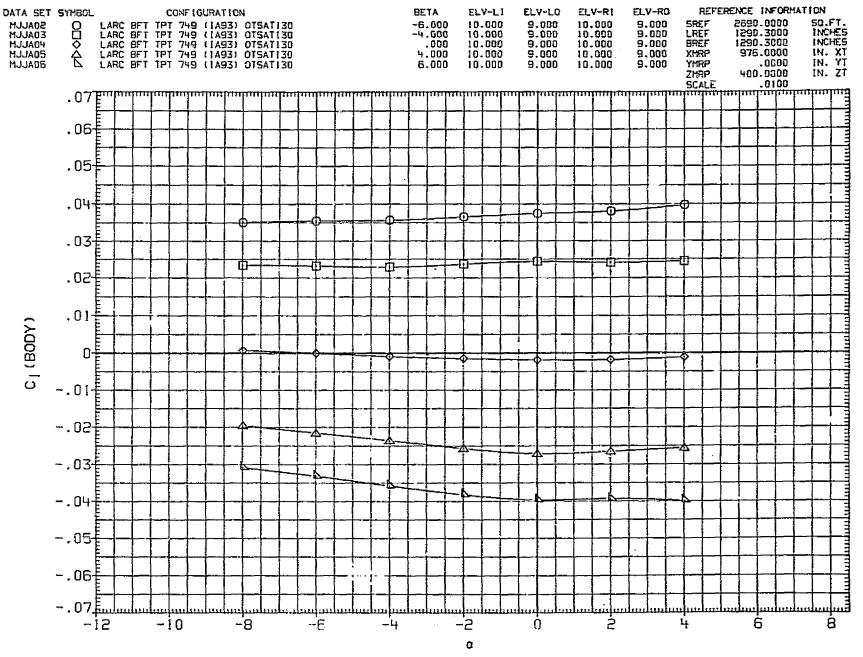


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B) MACH = .98

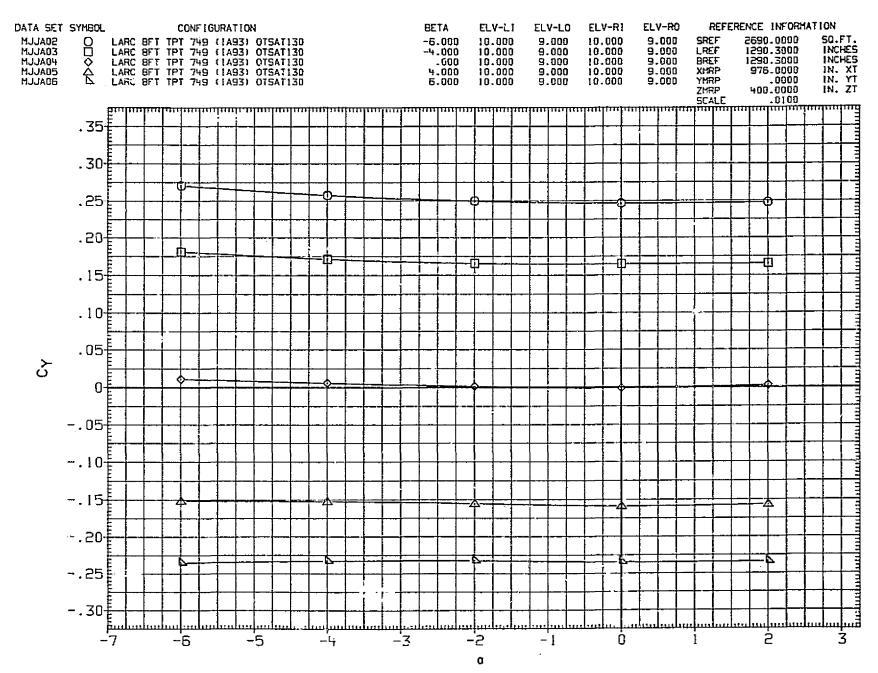


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

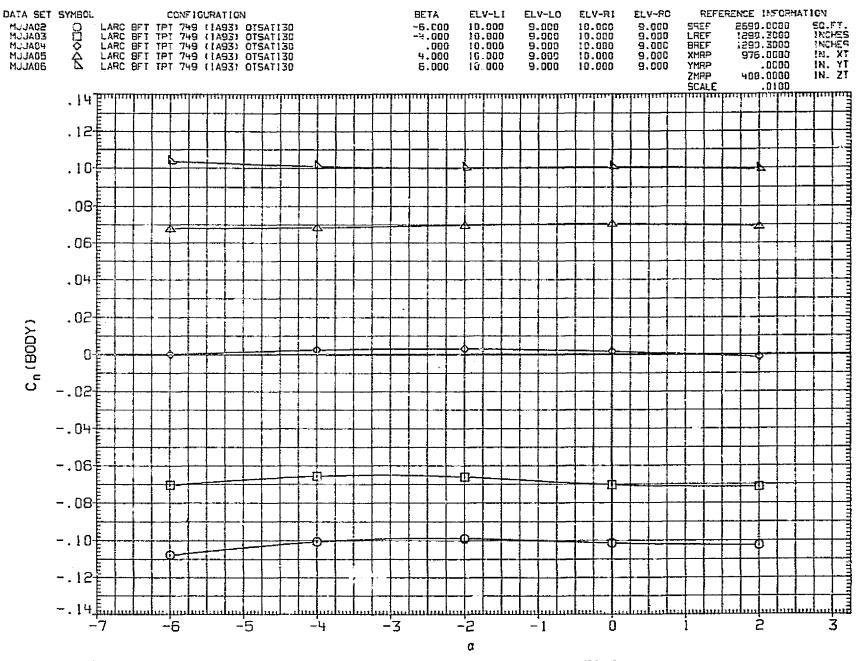


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(C) MACH = 1.15 PAGE 224

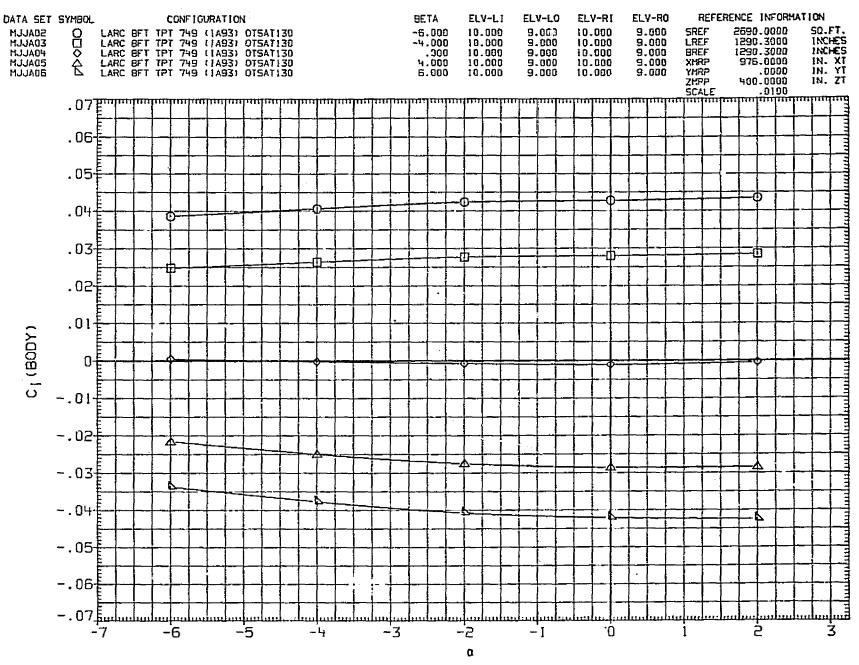


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

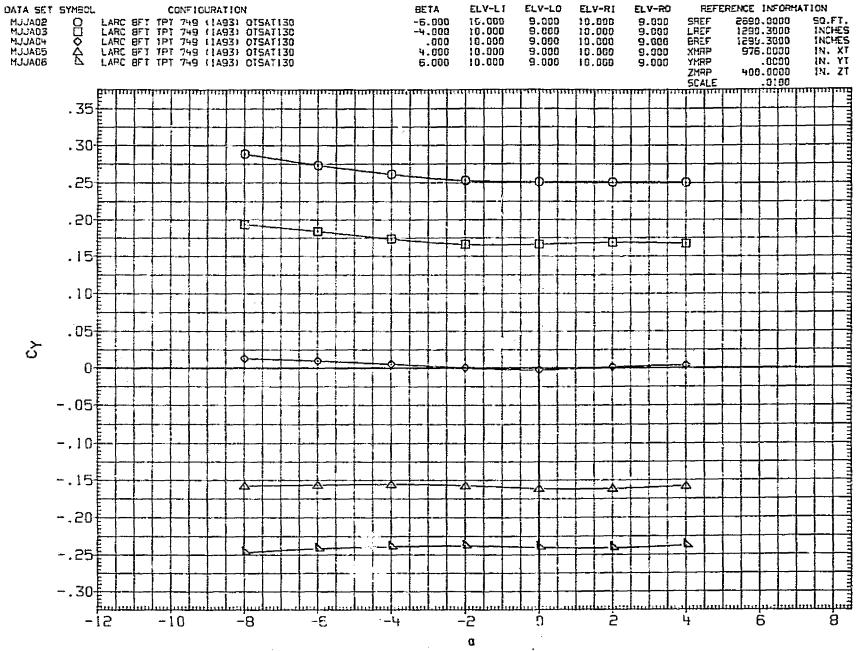


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

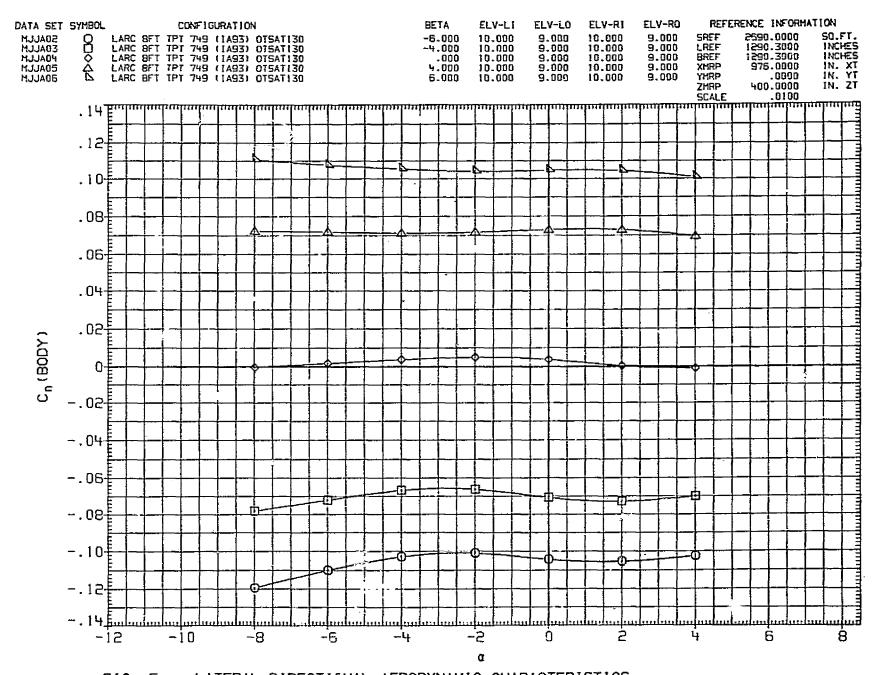


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

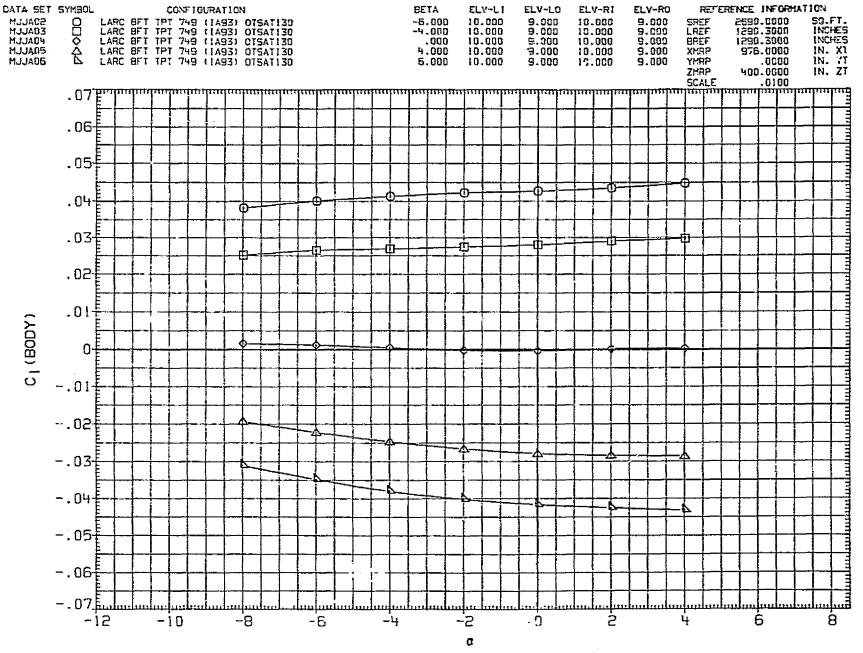


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

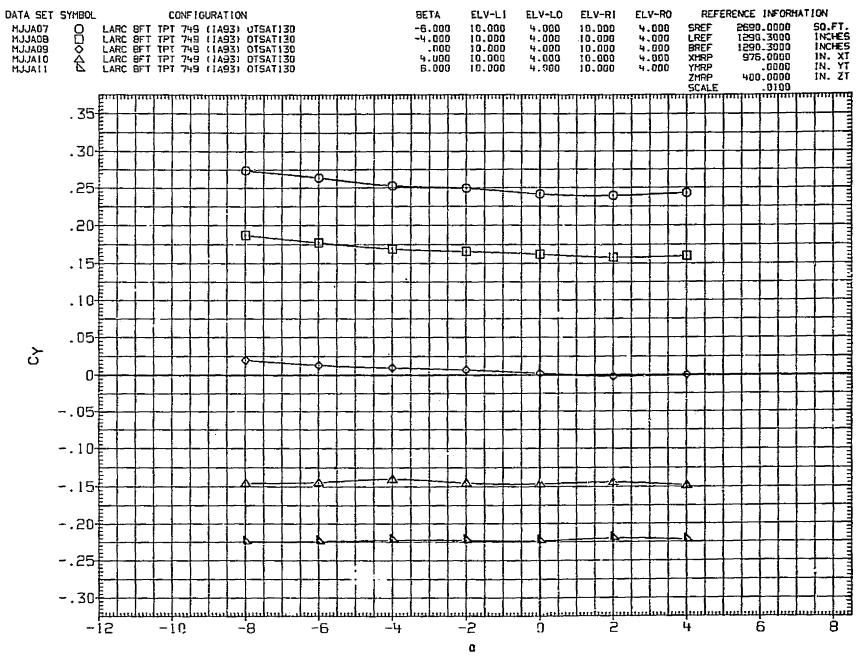
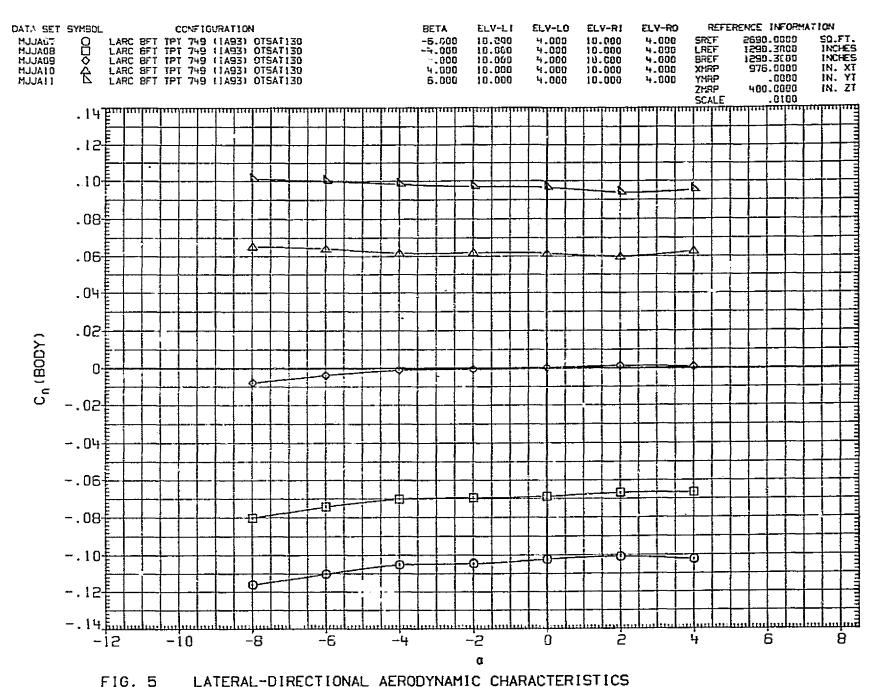


FIG., 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS



(A) MACH = .90 PAGE 230

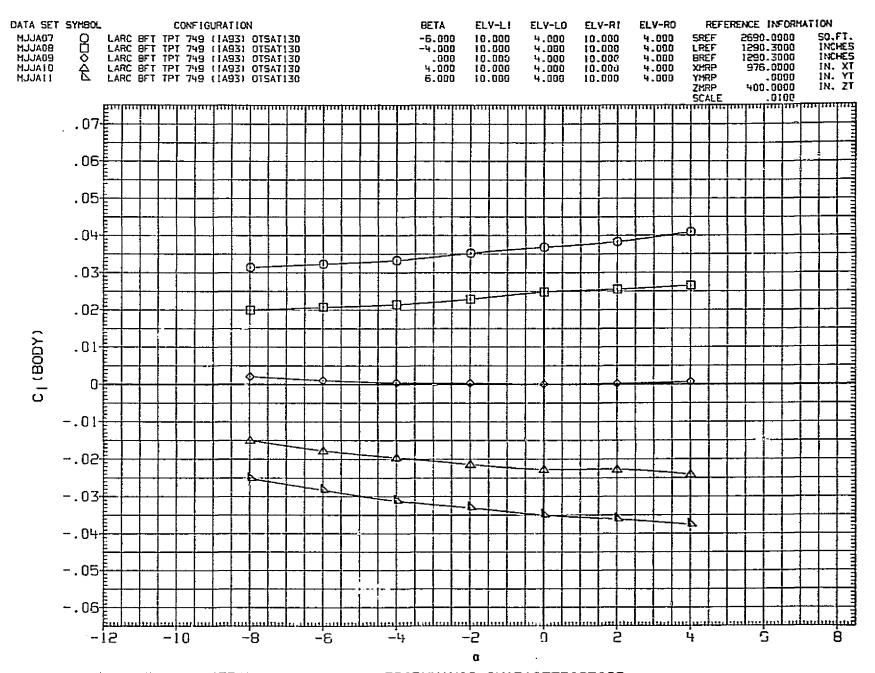


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

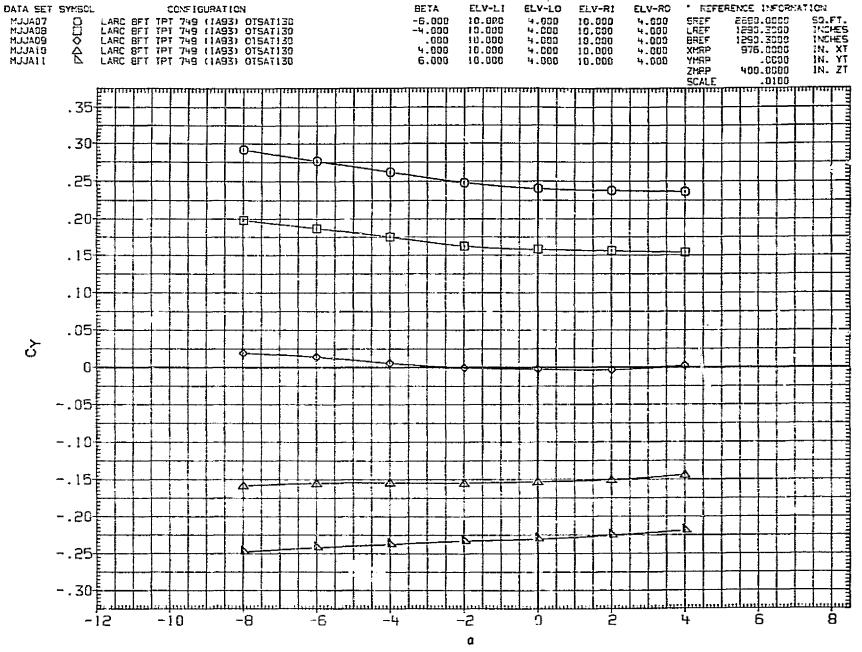


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

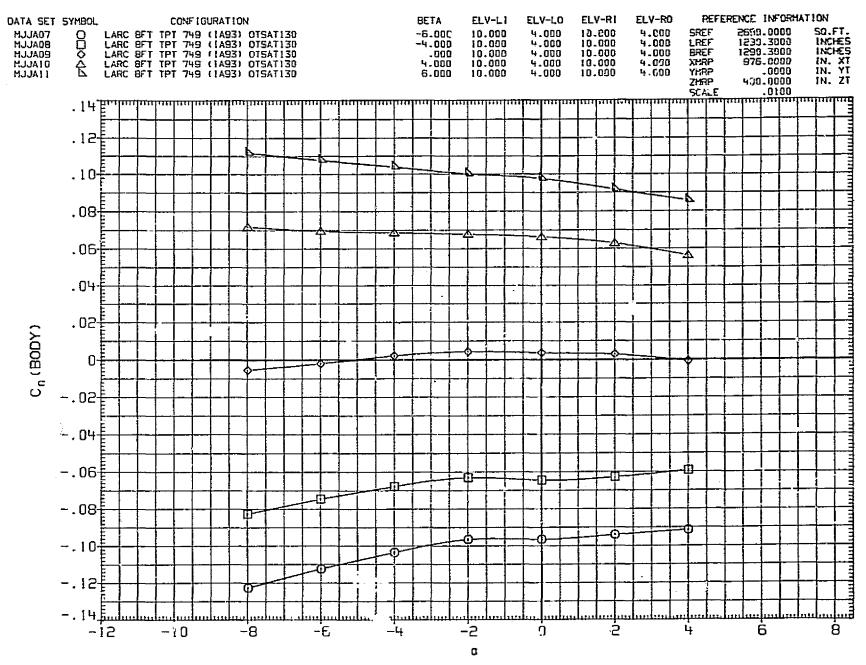


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

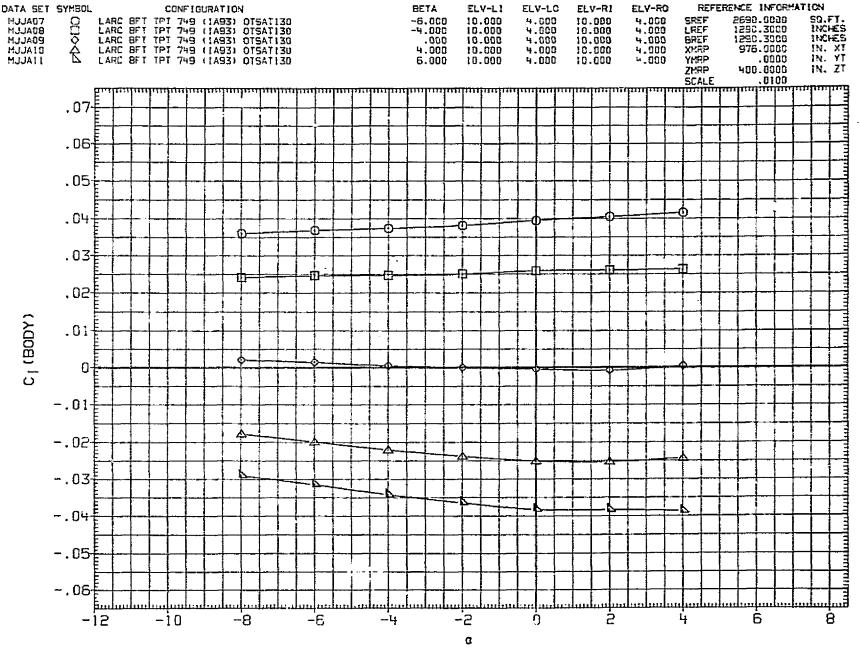


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

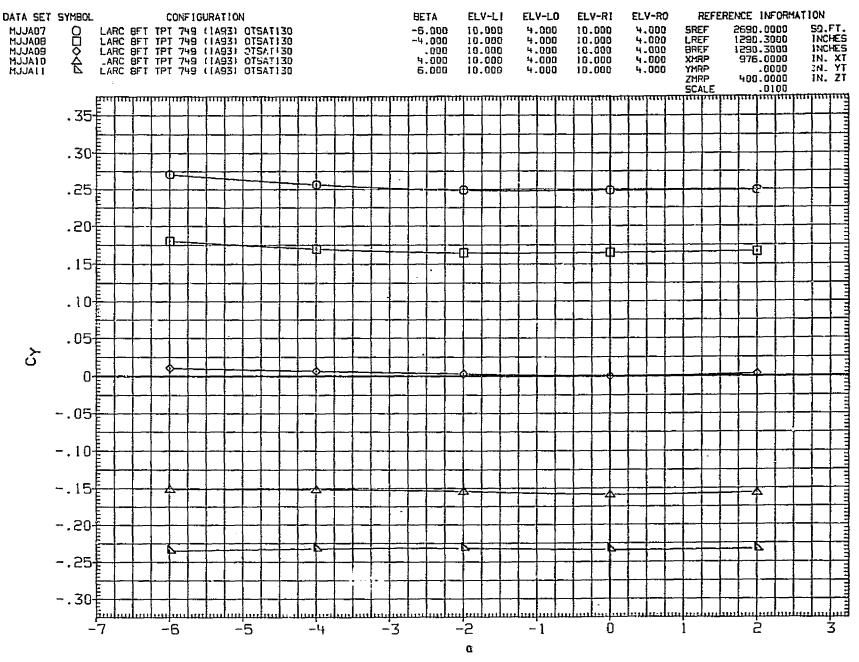


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

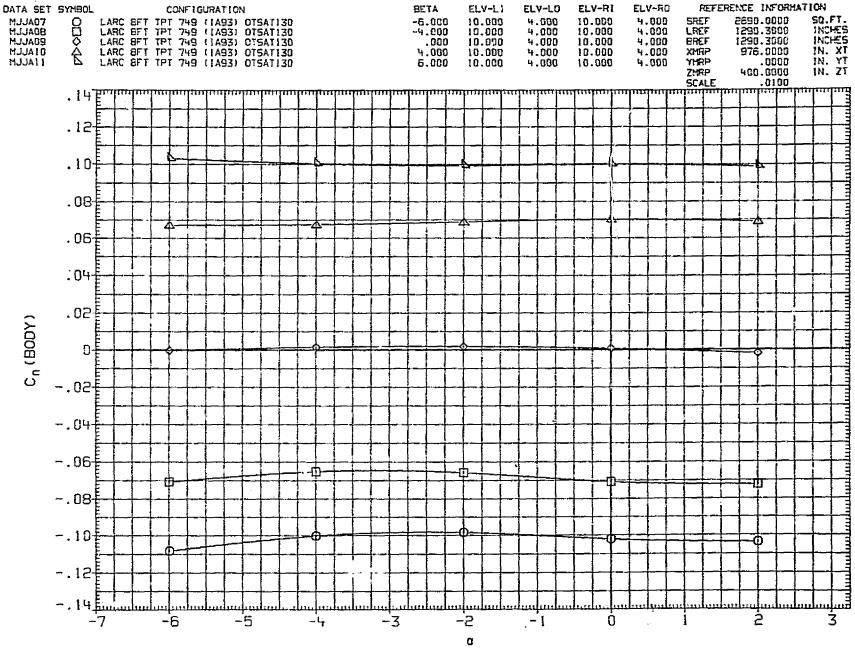


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

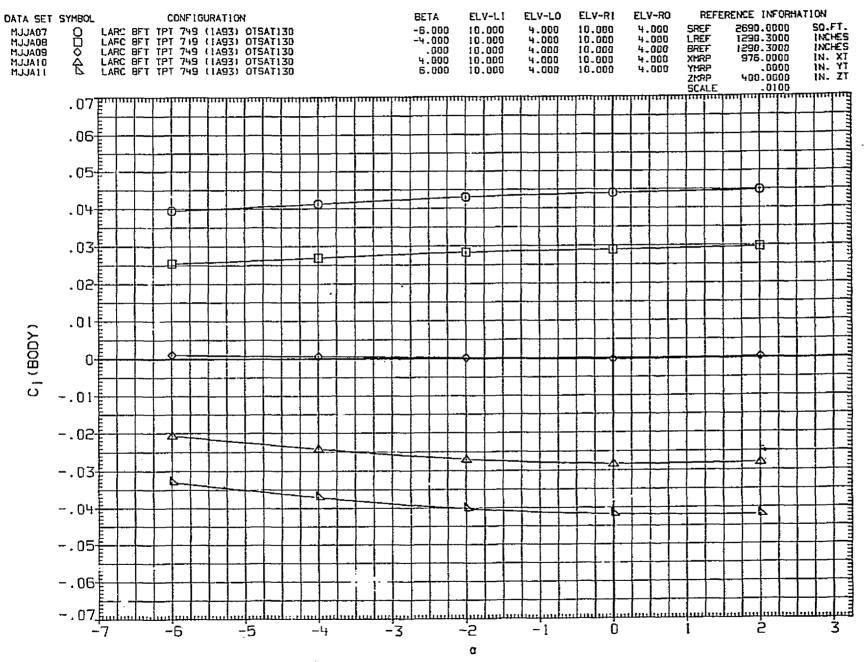


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

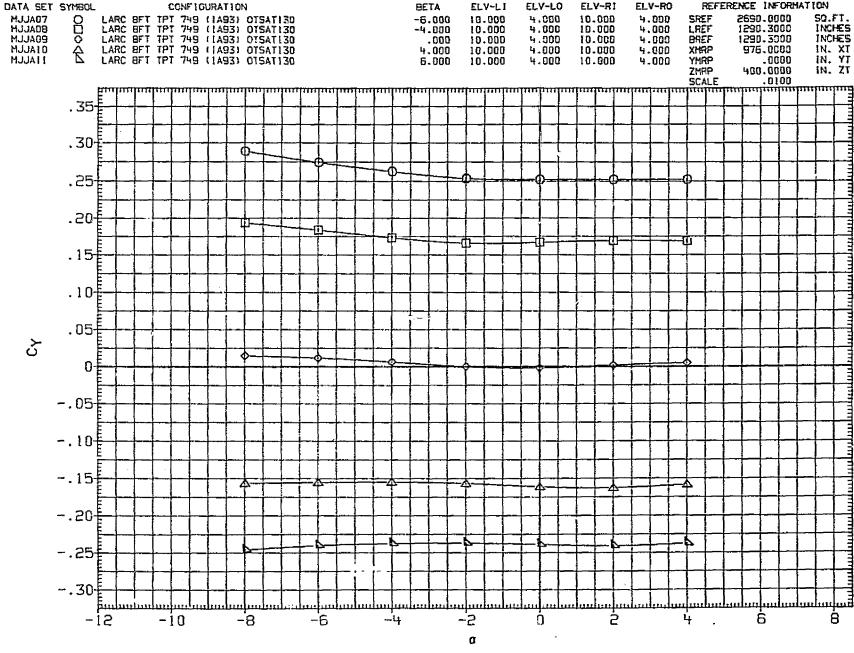


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20

PAGE

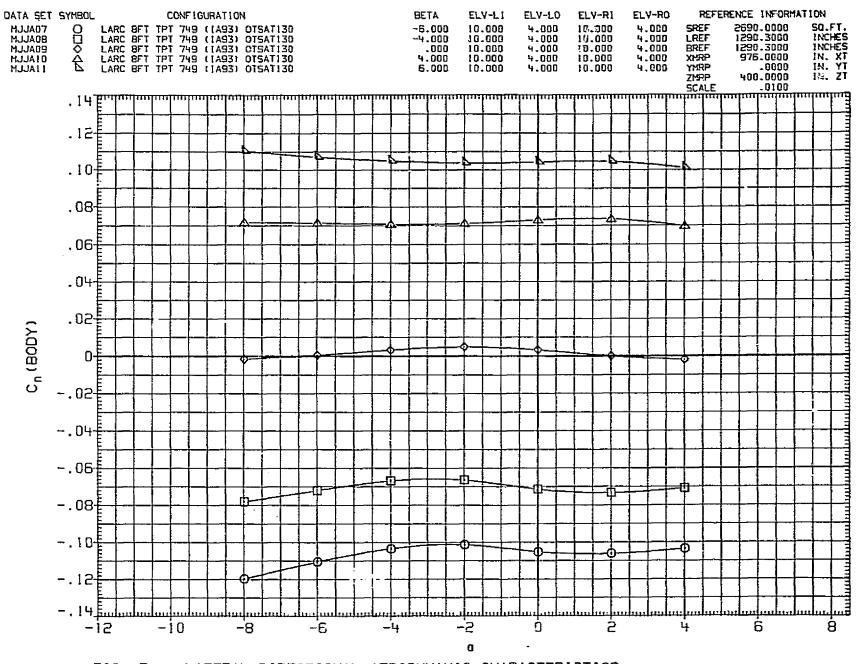


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

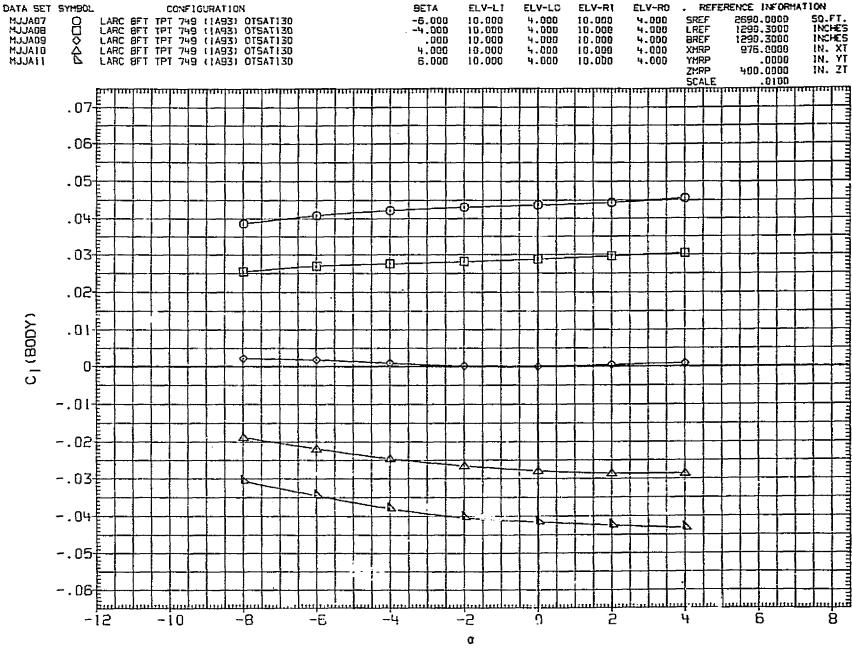


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20 PAGE 240

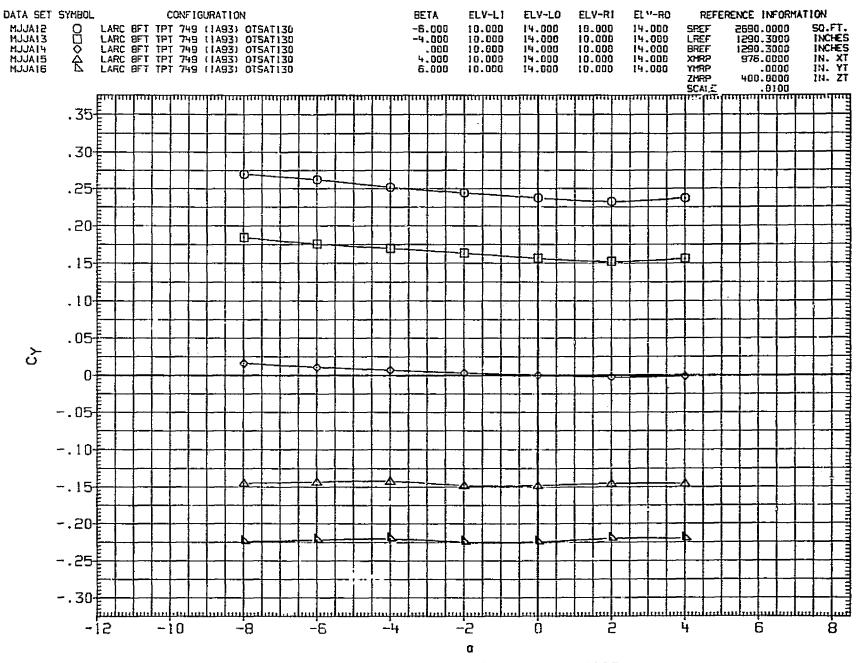


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(A)MACH = .90

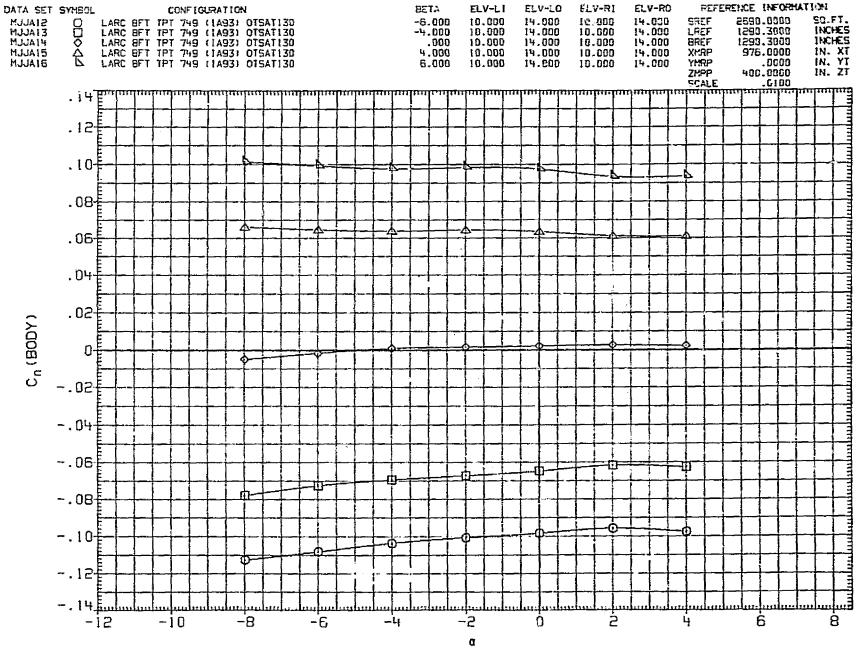


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

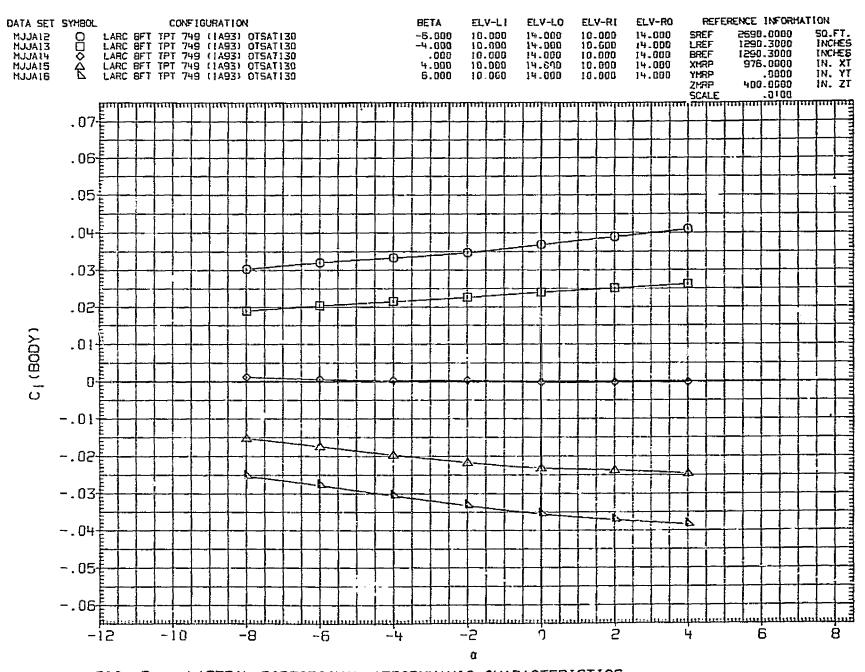


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

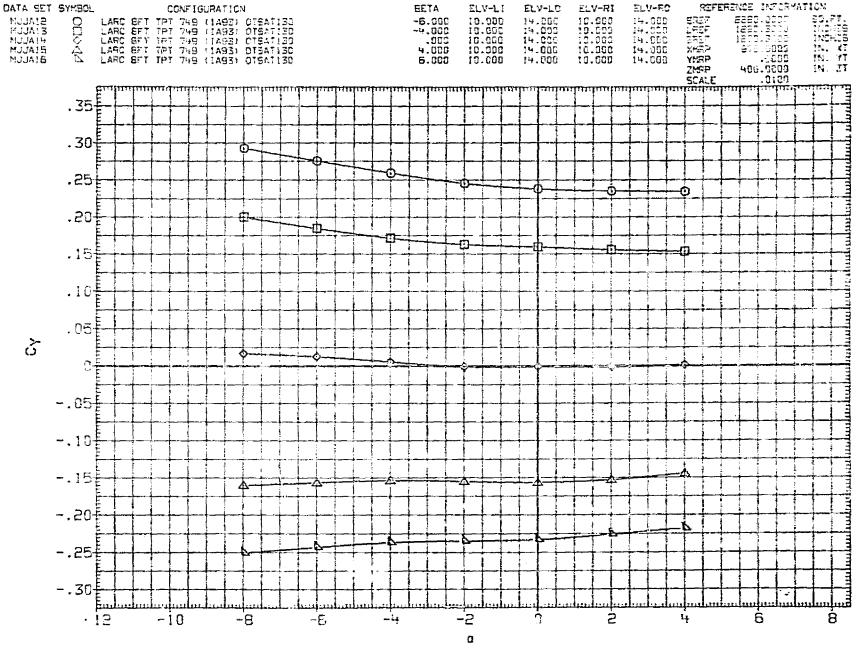


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

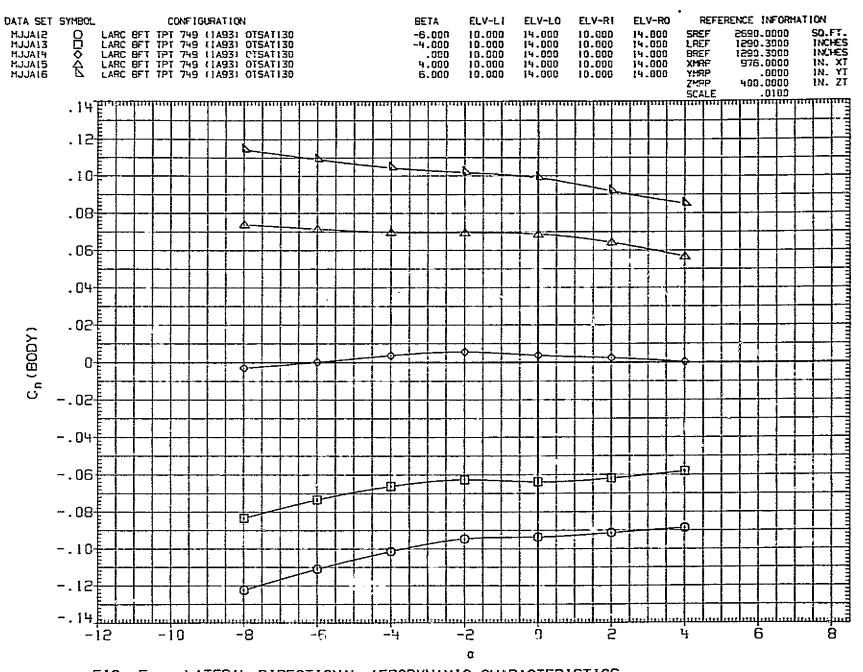


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

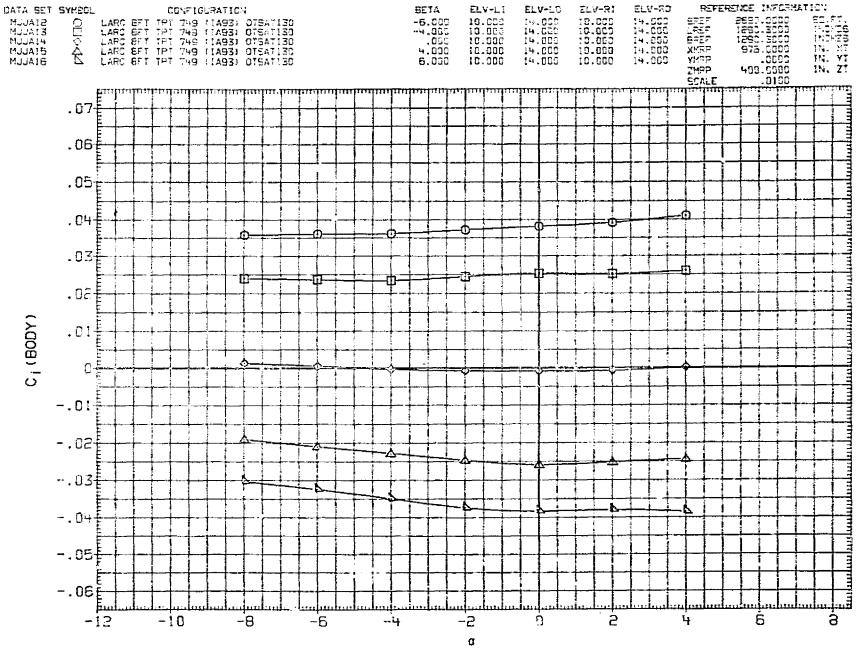


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B) MACH = .98 PAGE

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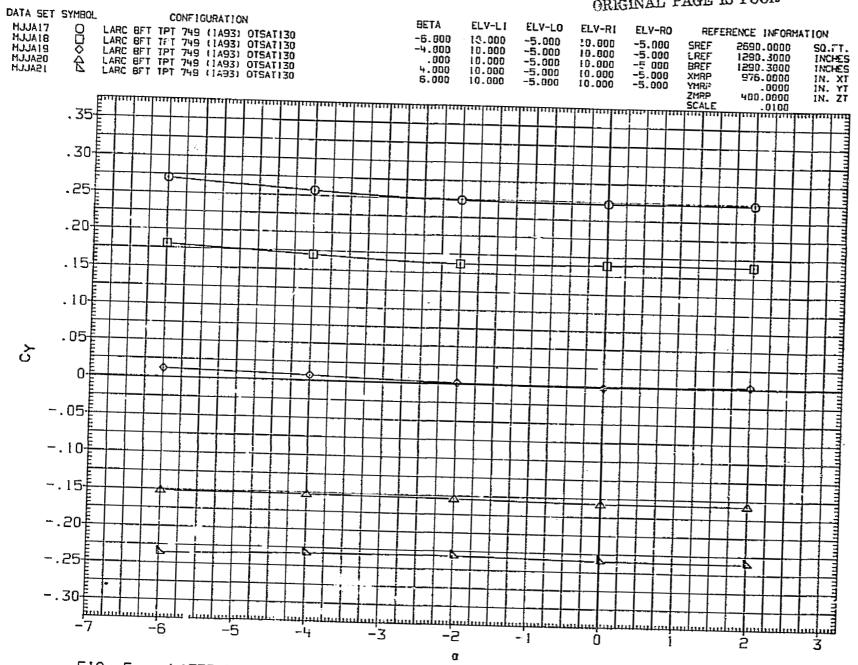


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS
(A) MACH = 1.15

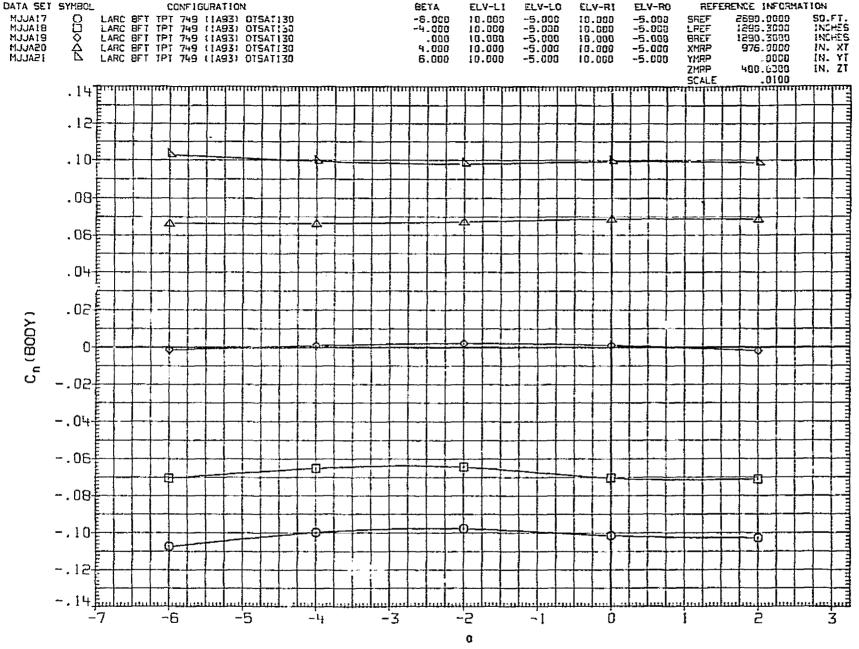


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

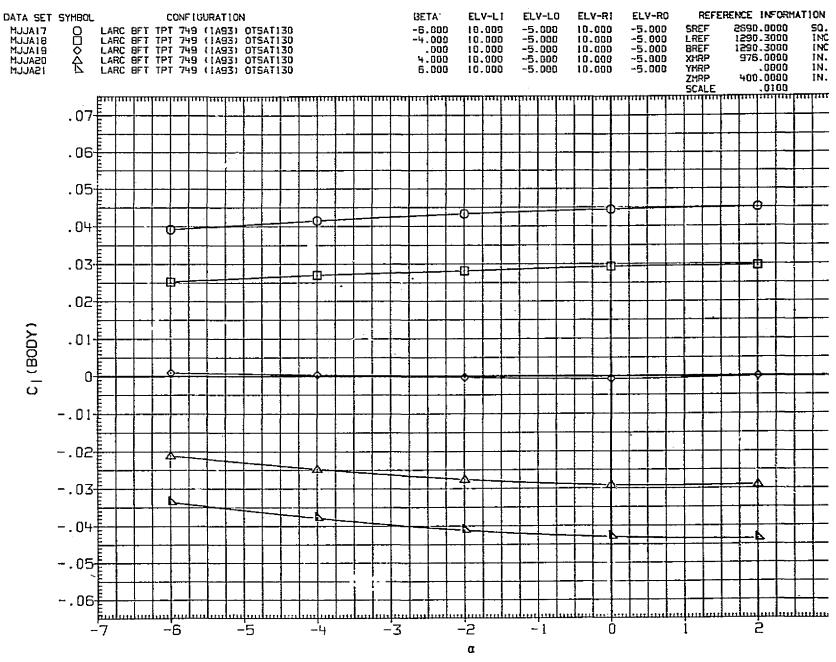
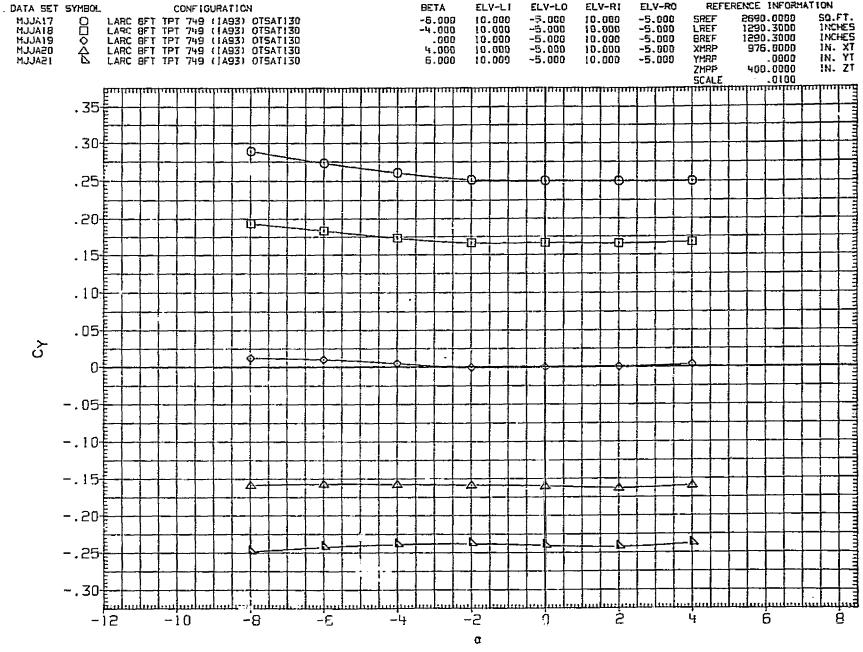


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS



LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS FIG. 5

REFERENCE INFORMATION

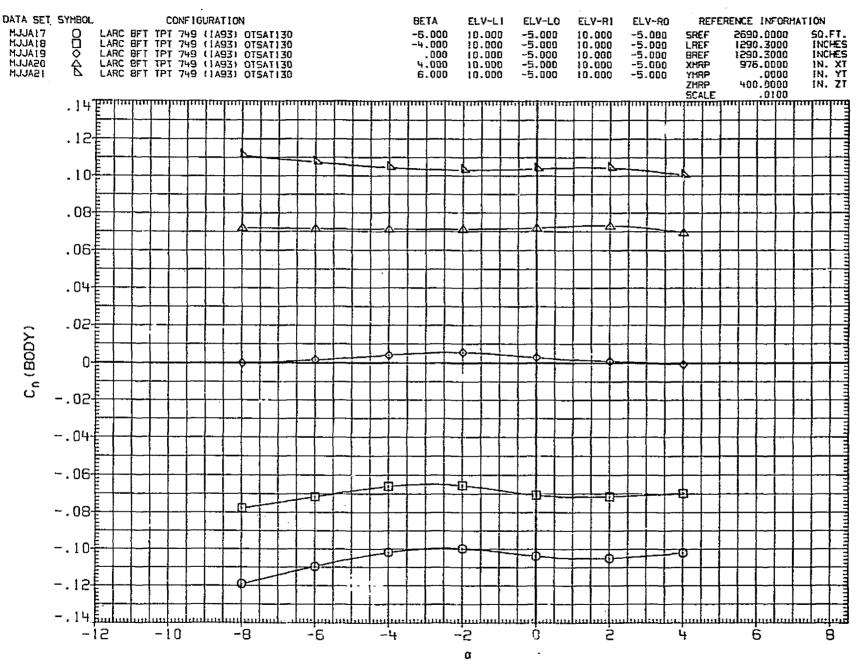


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

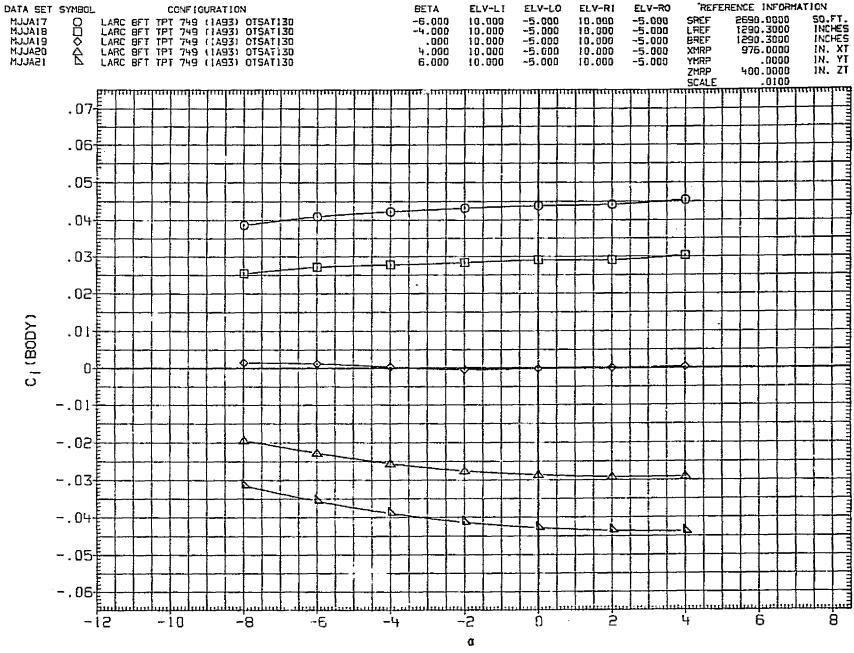


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

Applications of the same street

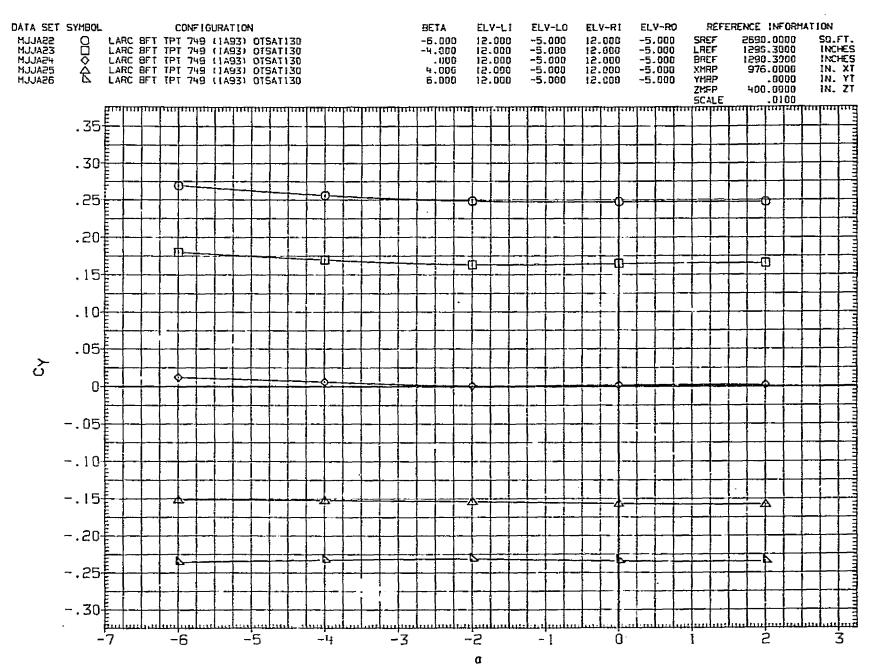


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

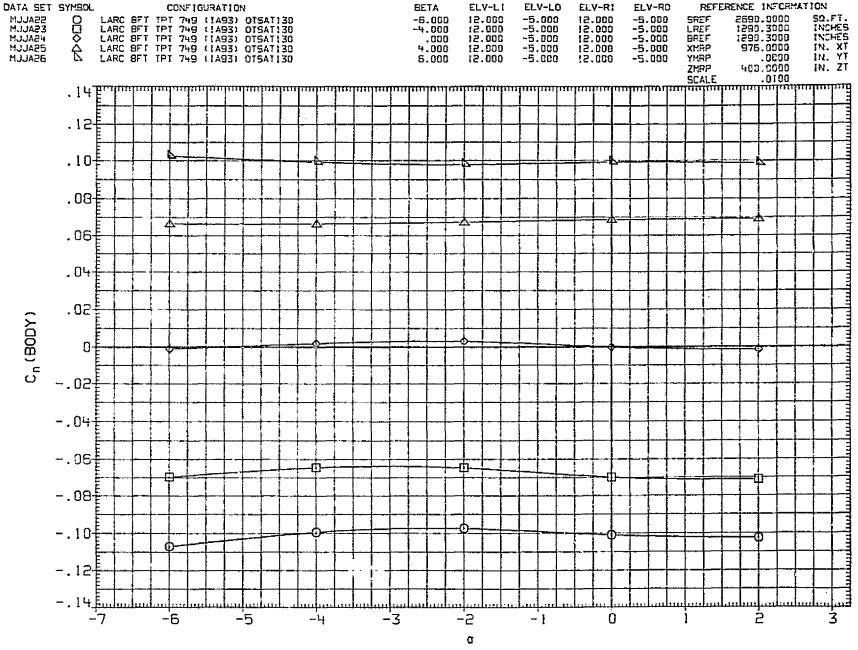


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(A) MACH = 1.15PAGE 254

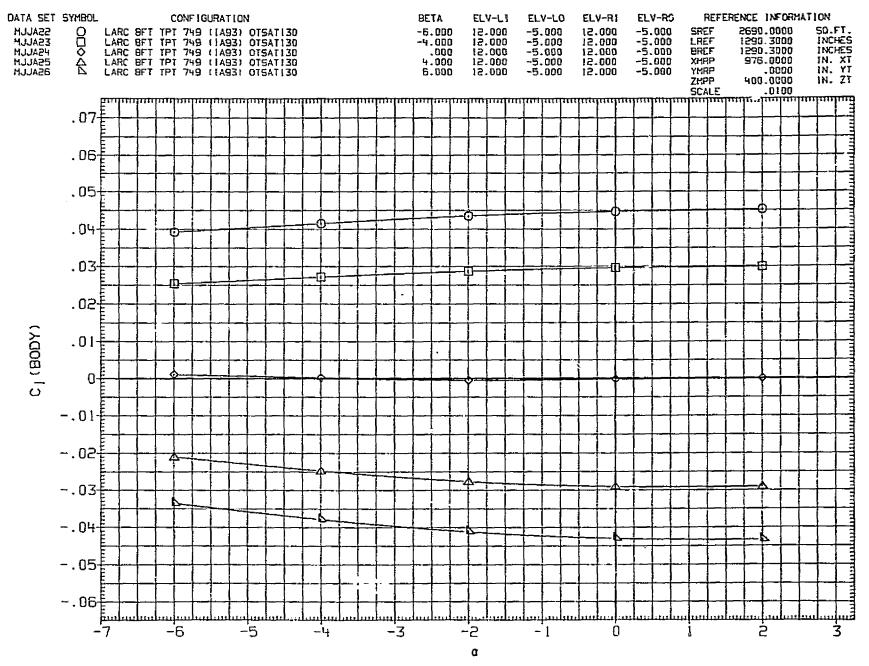


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

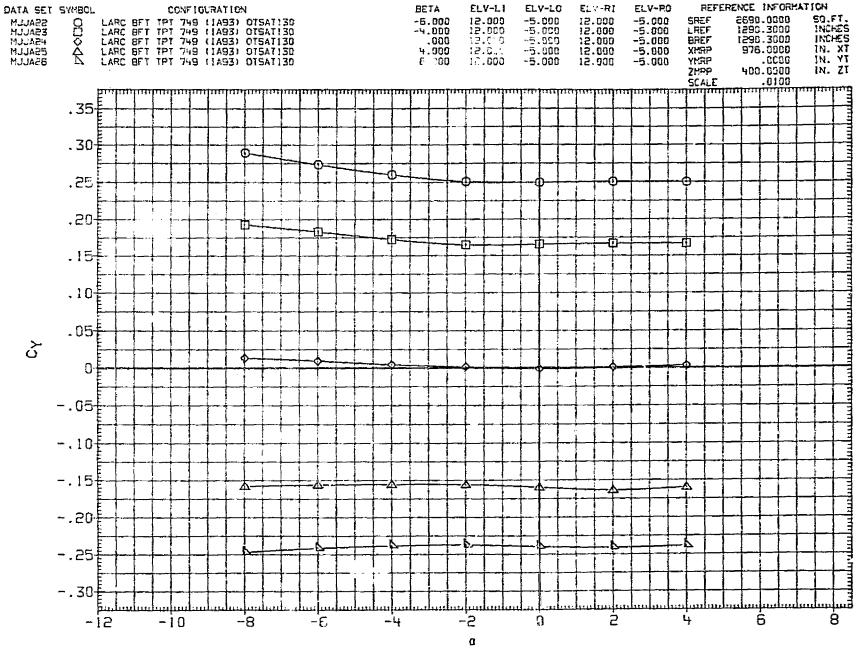


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

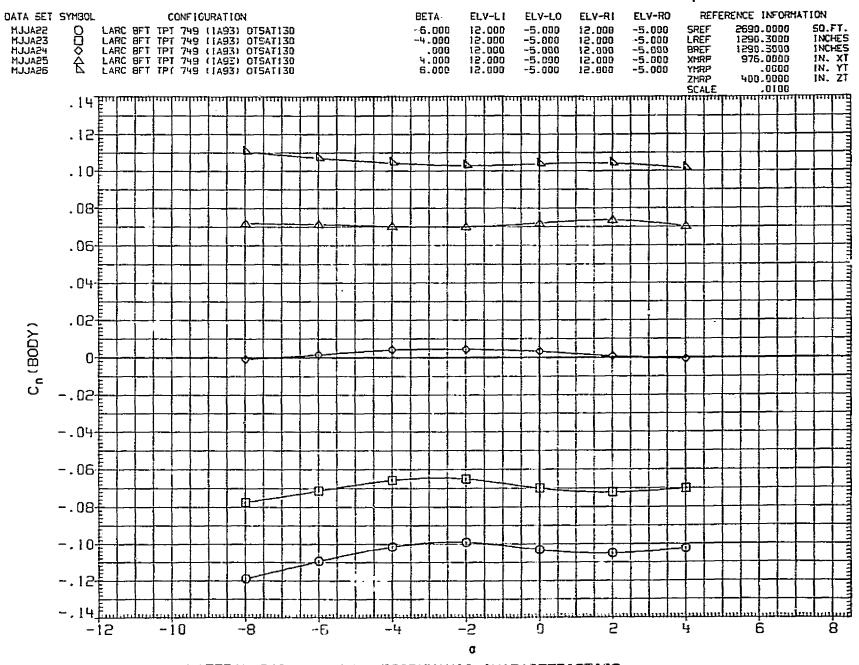


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B) MACH = 1.20 PAGE

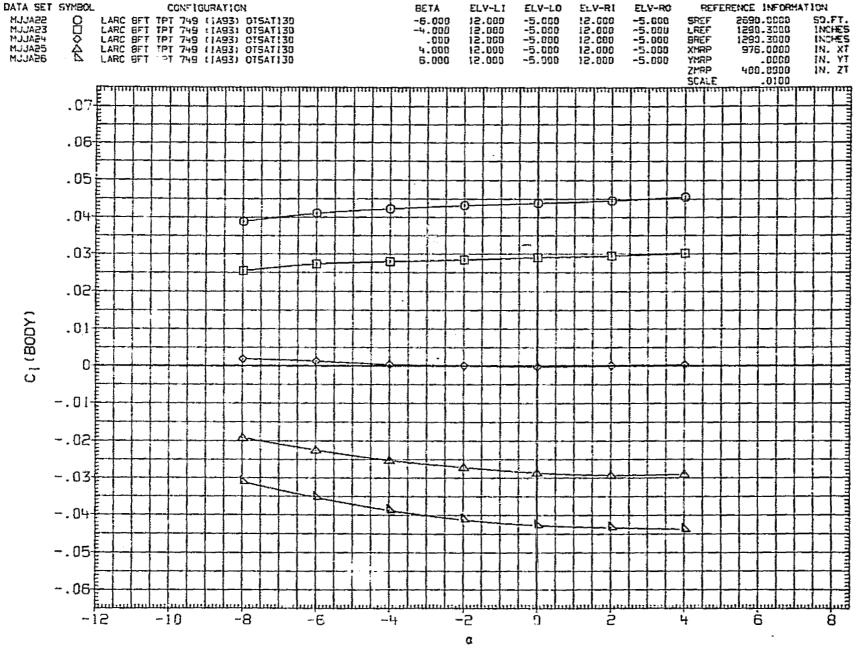


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

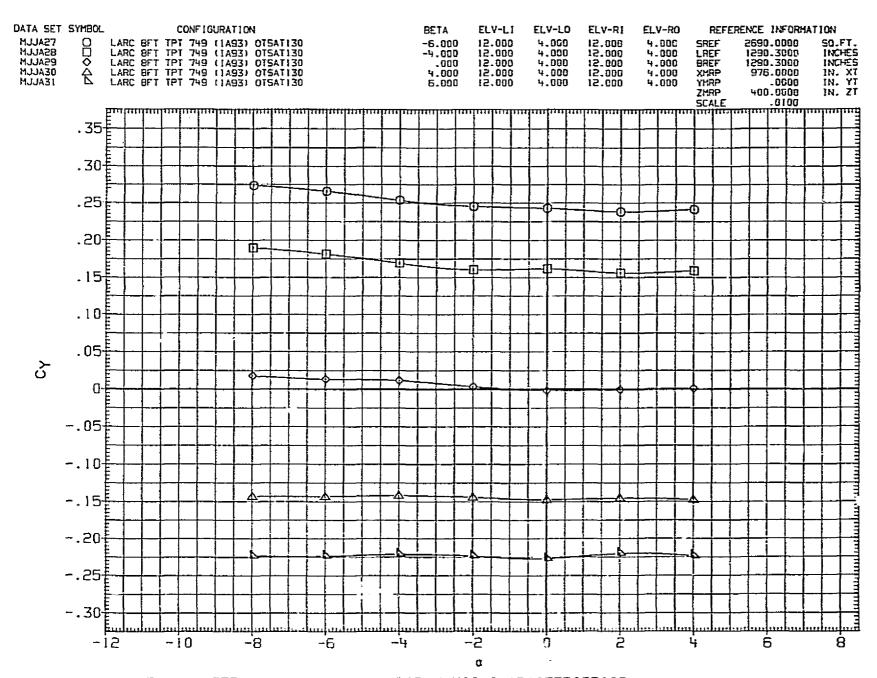


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

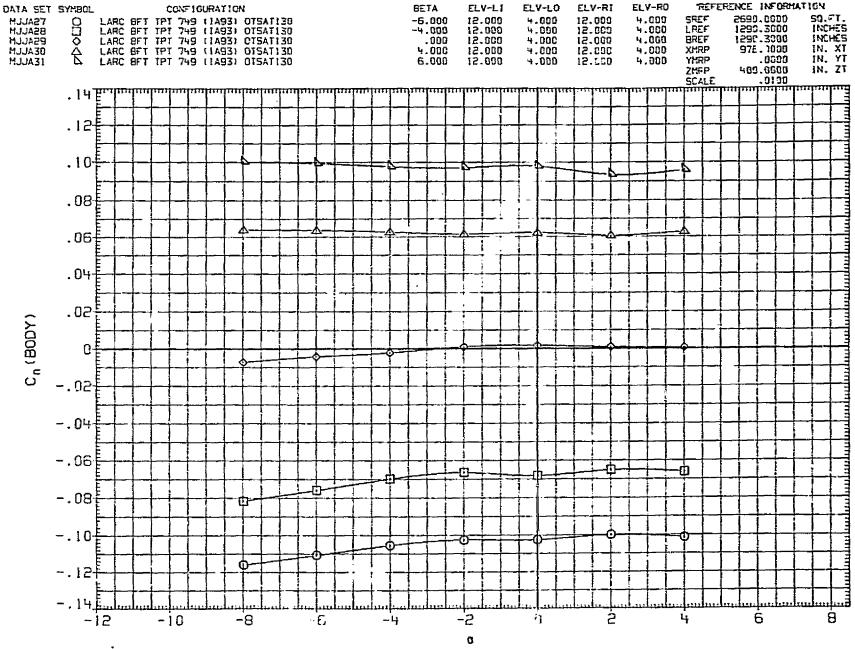


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

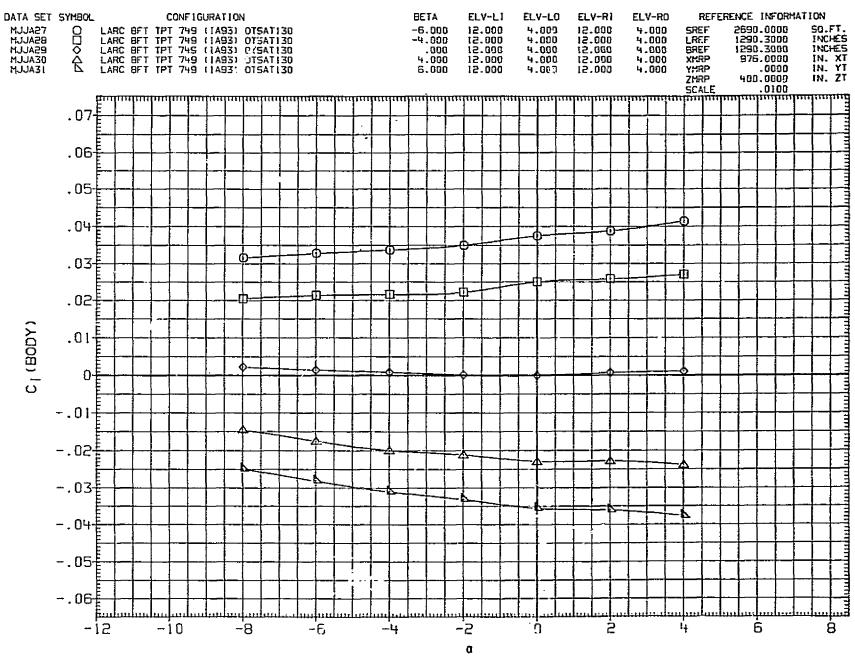


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

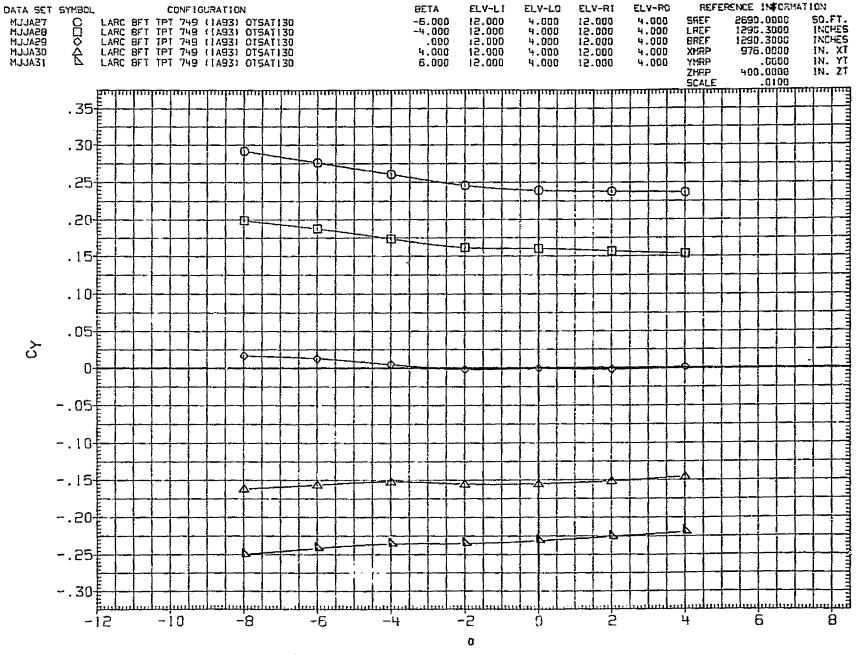
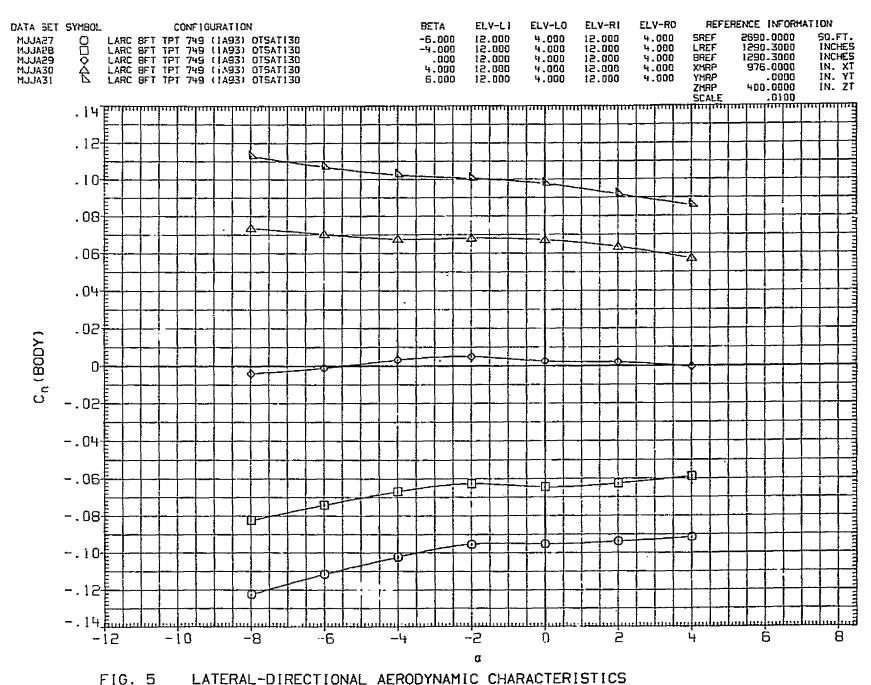


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS



TO: 3 EXILIAD DIRECTIONAL ACRODITATIO CHARACTERISTICS

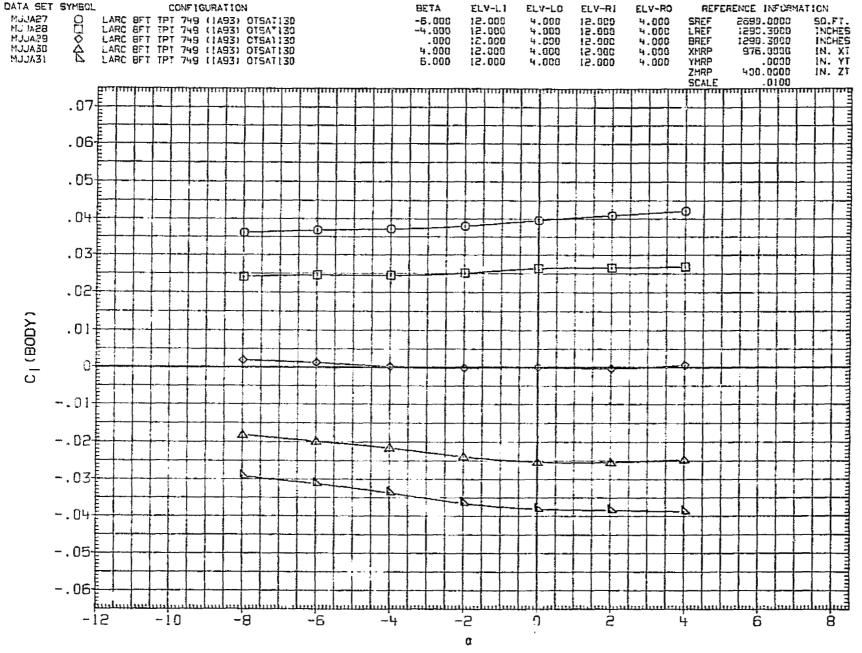


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B)MACH = .98

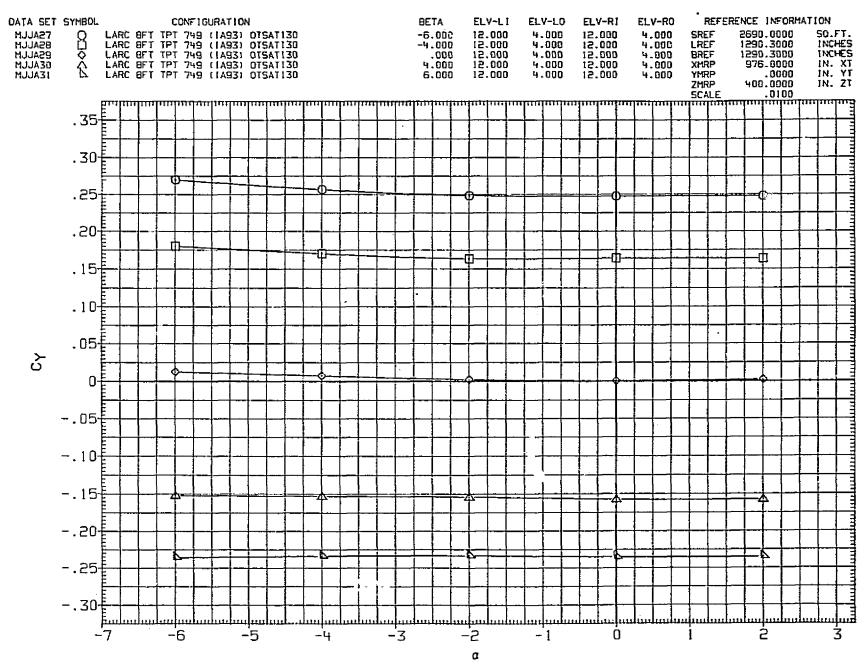
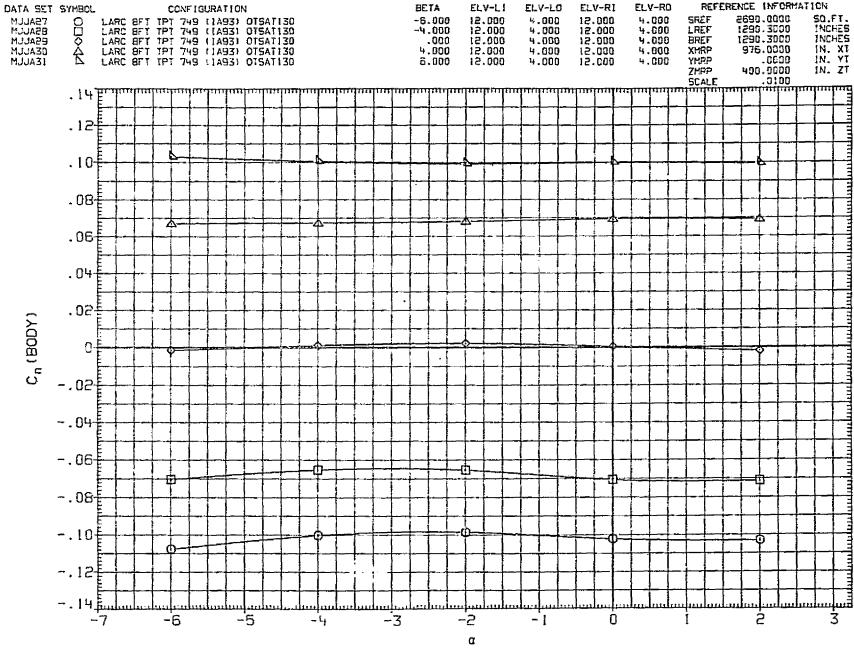


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS



LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS FIG. 5

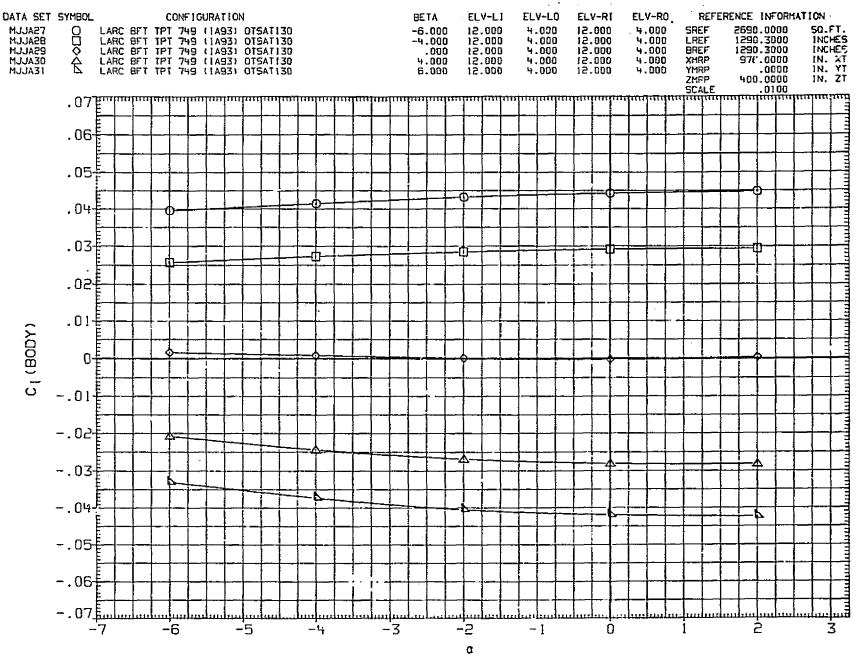


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

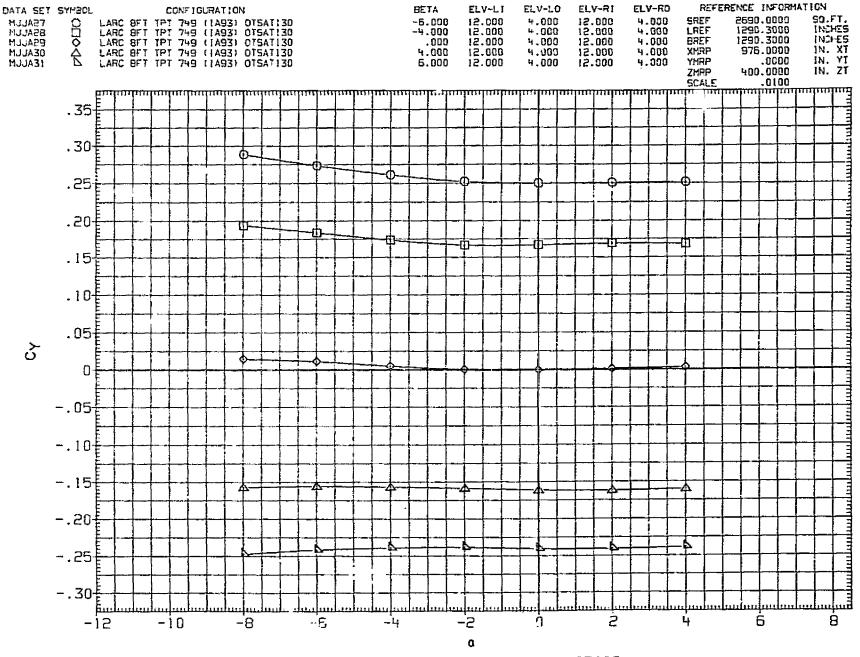


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

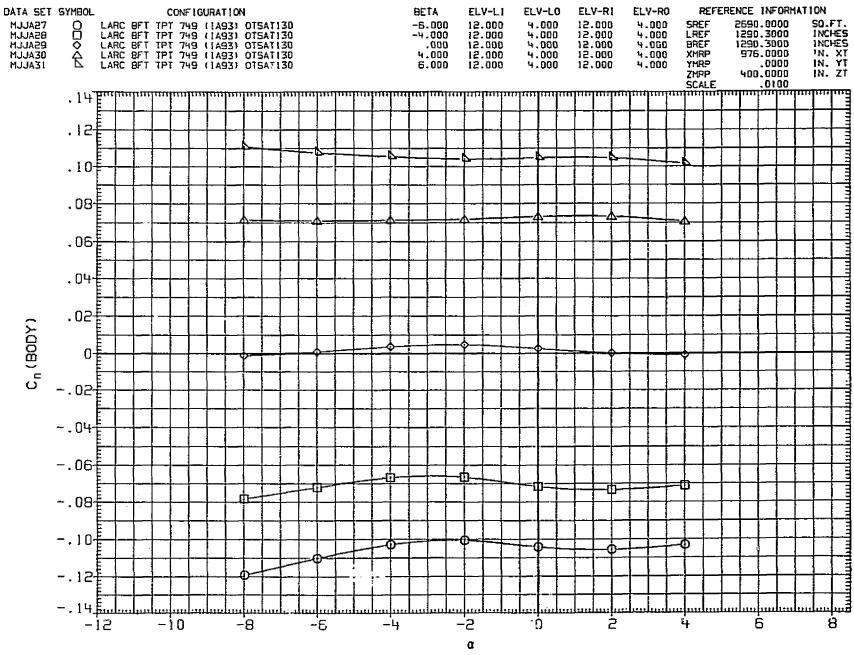


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

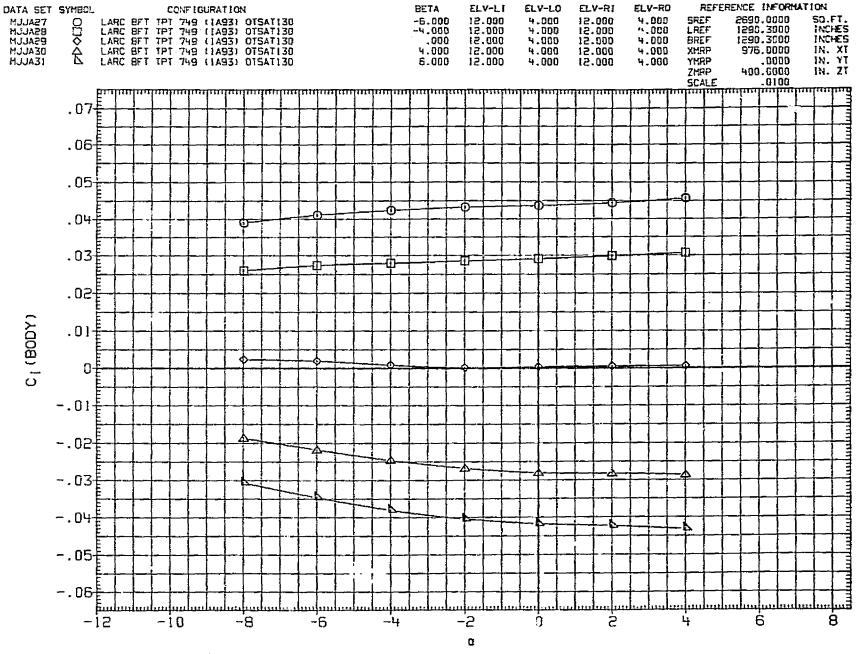


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(D) MACH = 1.20 PAGE 270

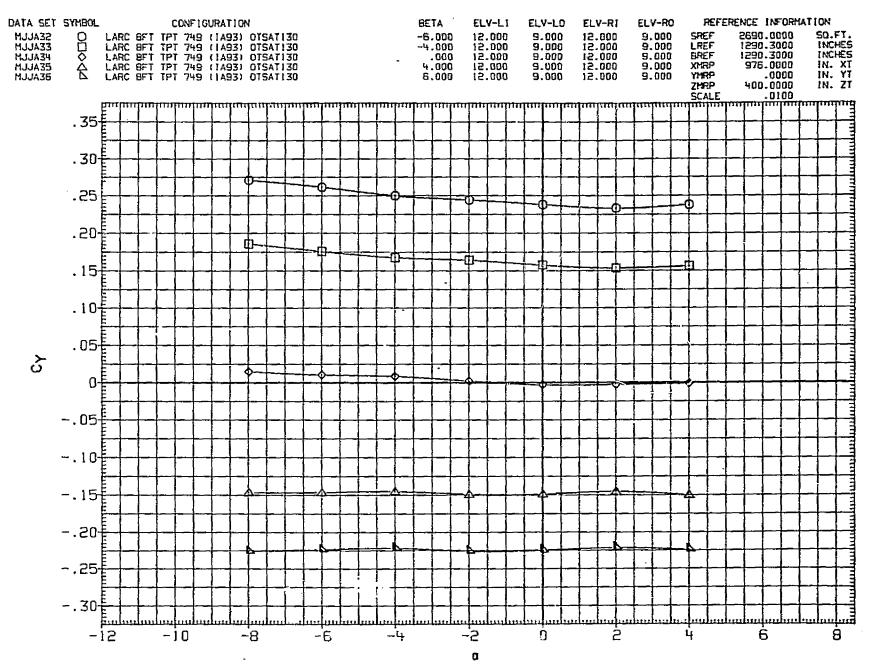


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

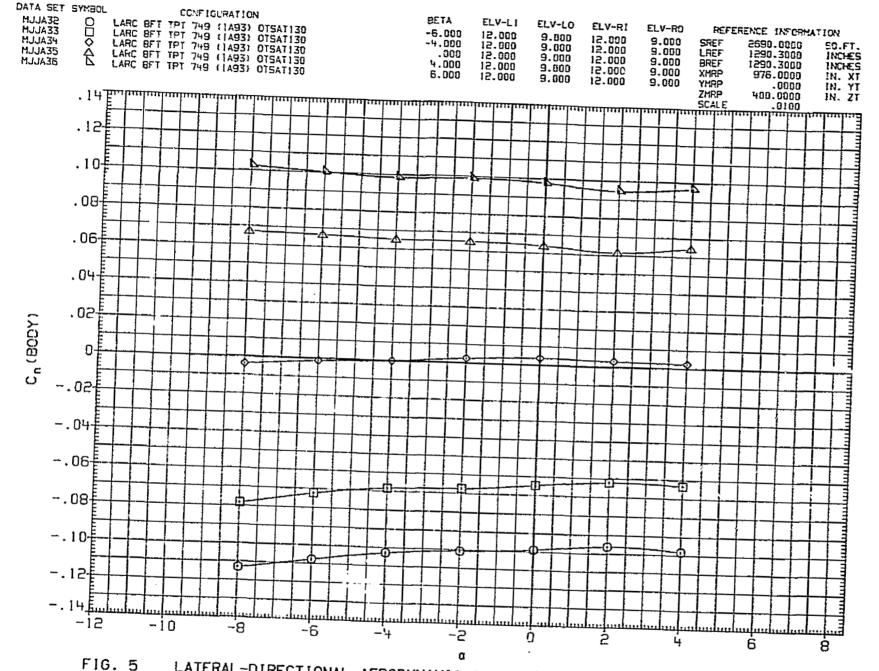


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(A)MACH = .90

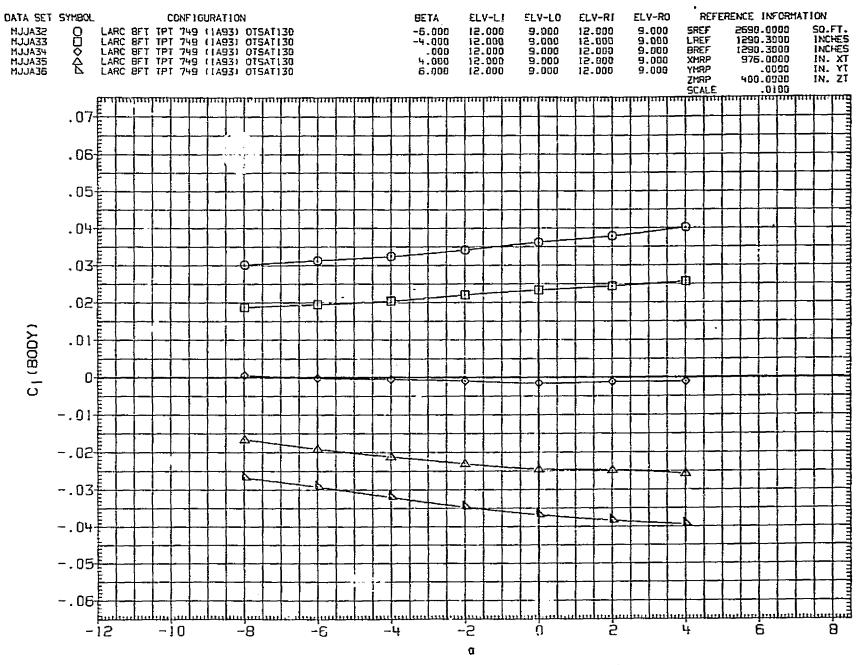


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

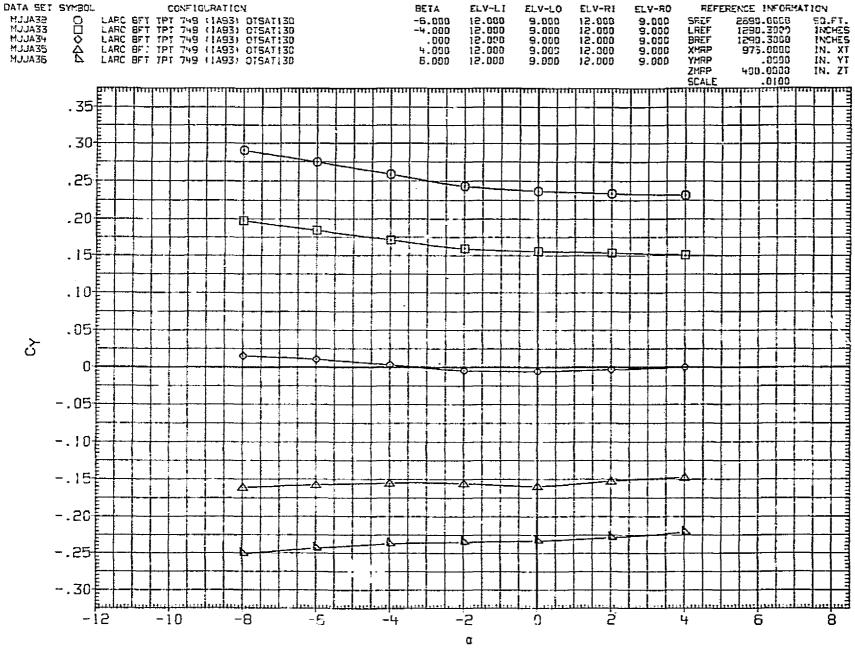


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B) MACH = .98PAGE 274

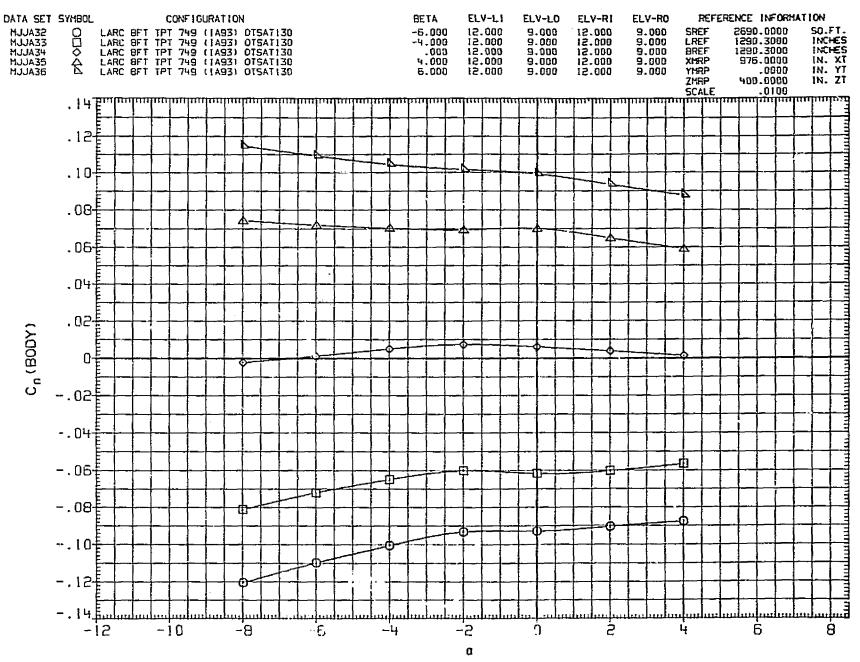


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

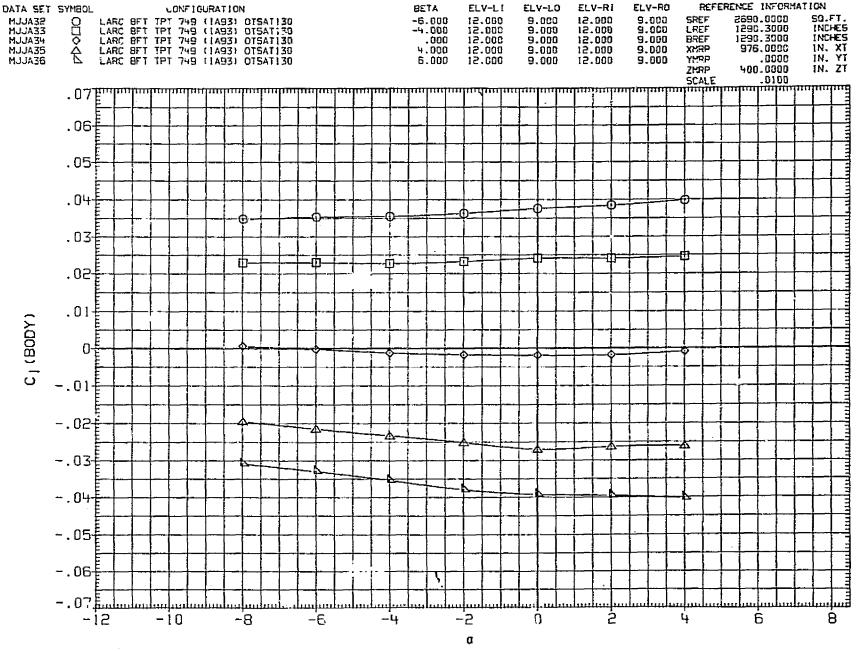


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

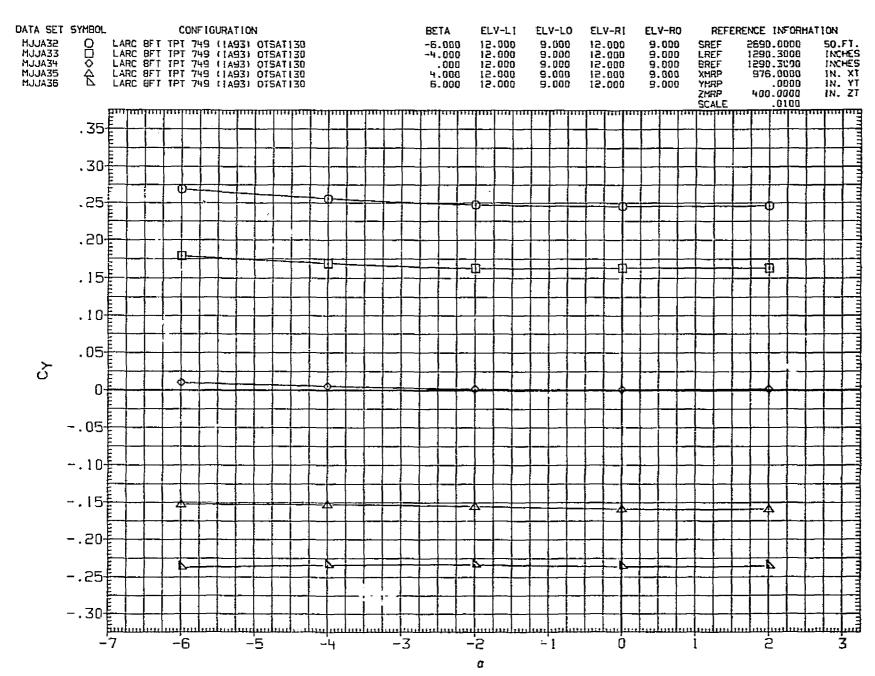
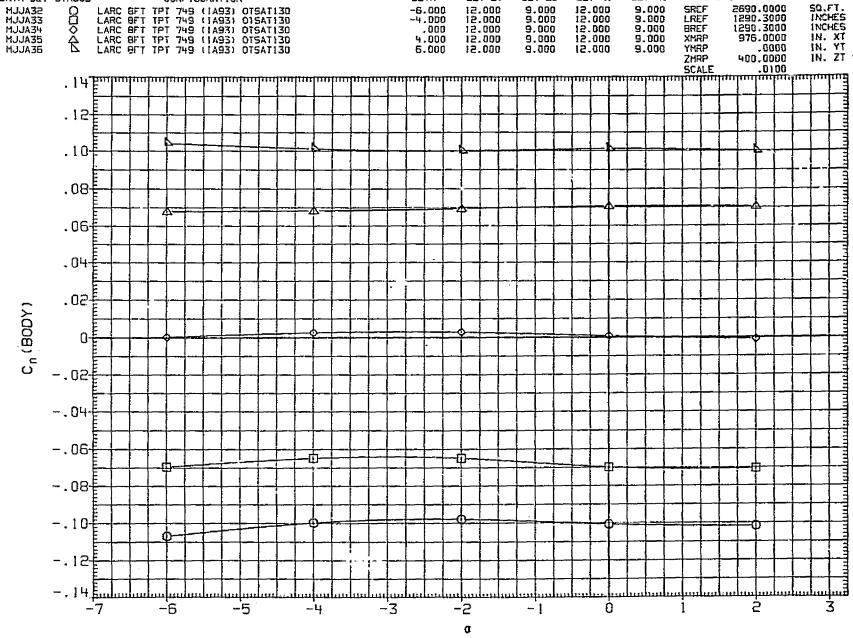


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(C)MACH = 1.15 PAGE 277



BETA

ELV-L1

ELV-LO

ELY-RI

ELV-RO

FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

DATA SET SYMBOL

CONFIGURATION

REFERENCE INFORMATION

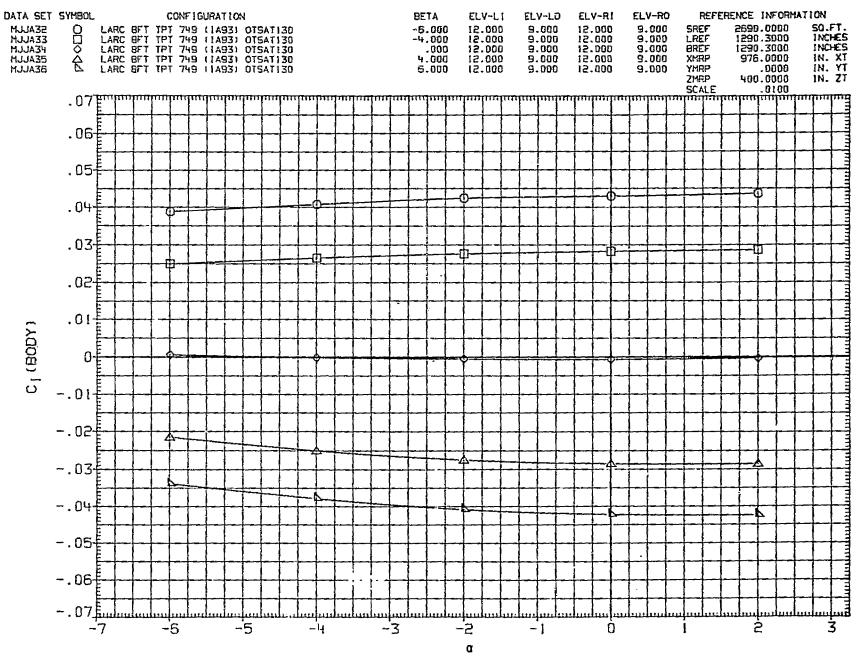


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

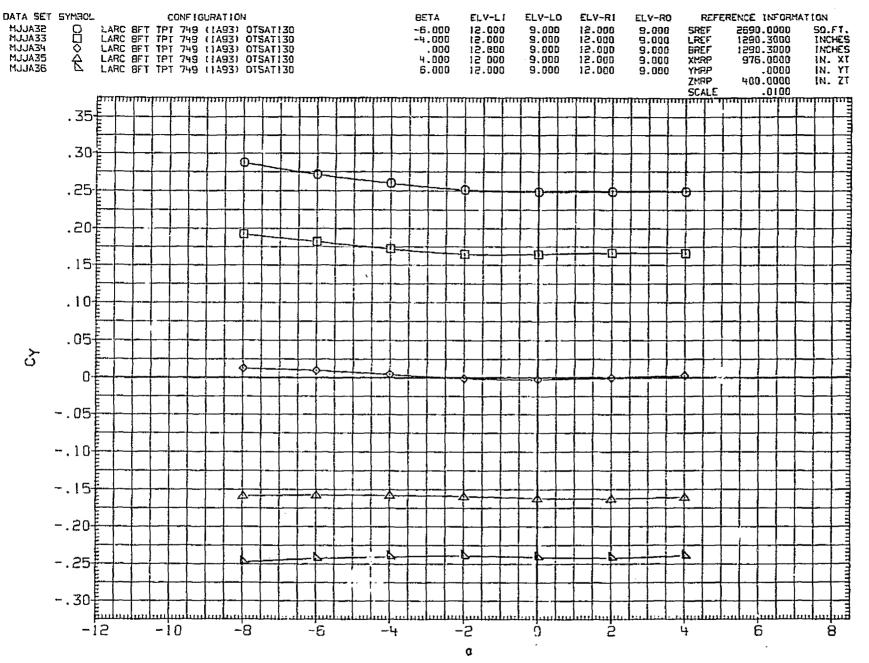


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

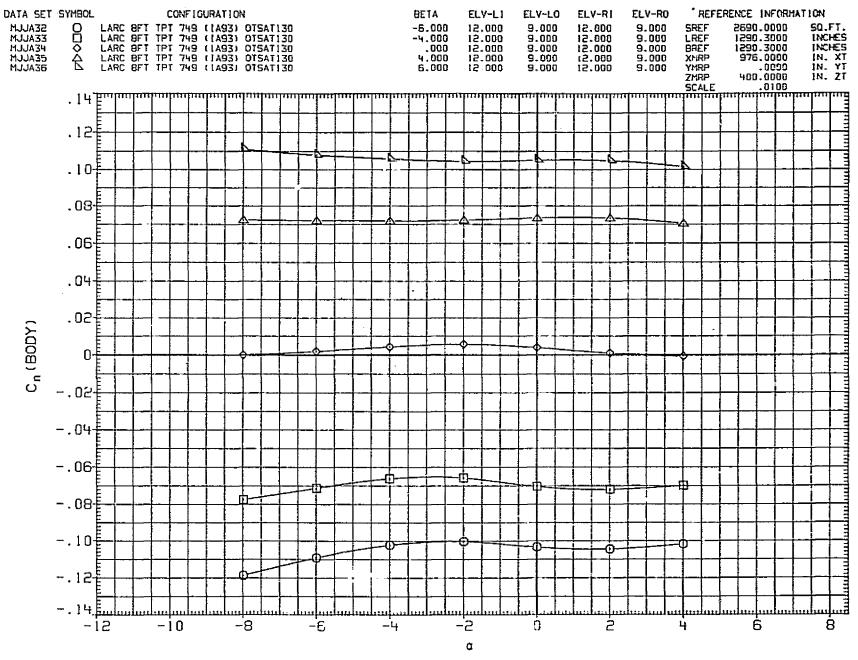


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

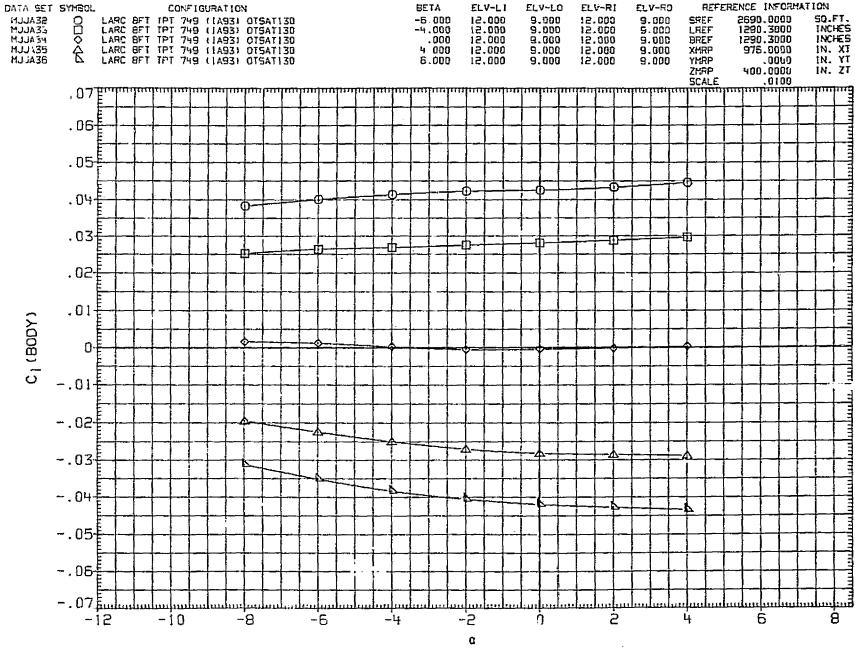


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(D) MACH = 1.20 PAGE 282

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOT

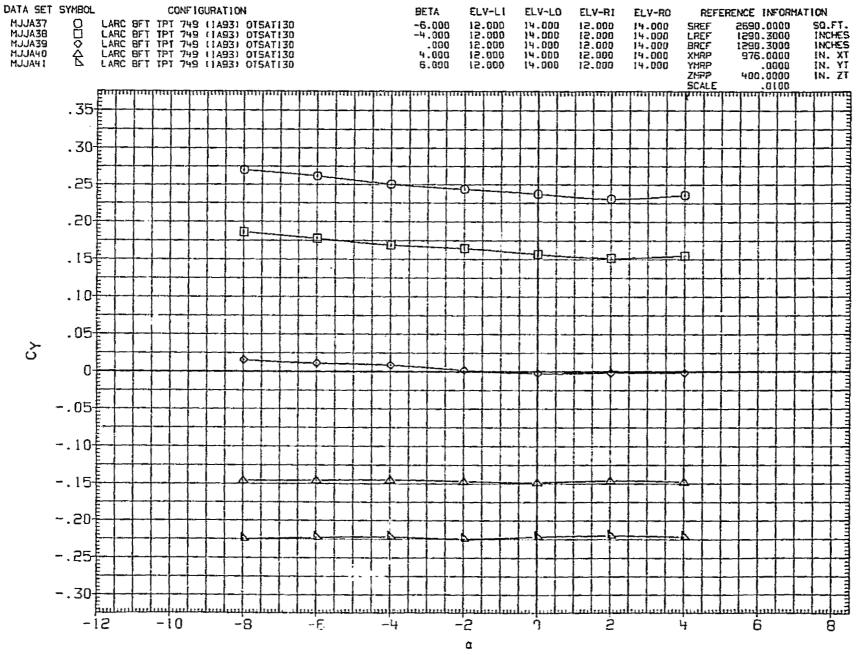


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

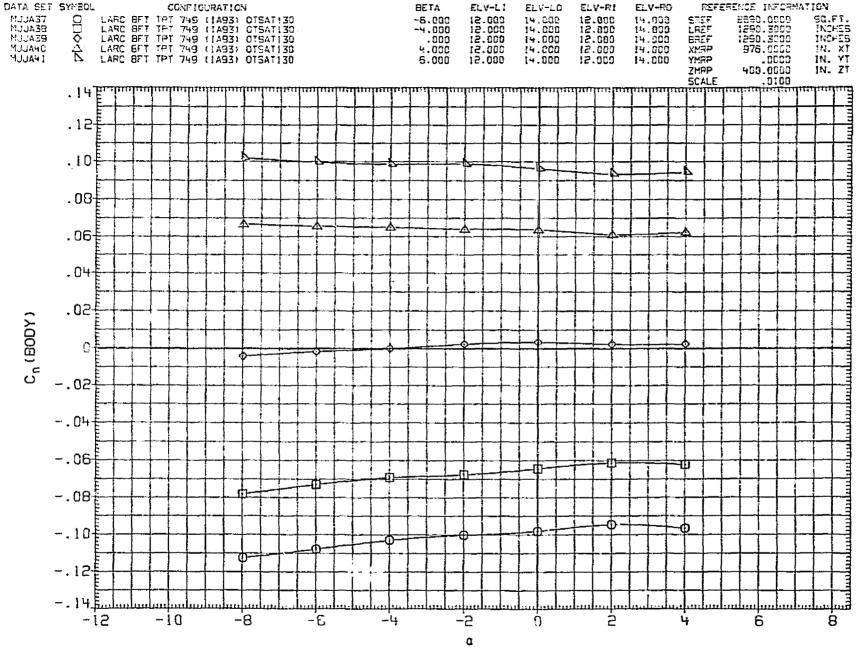


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(A)MACH = .90 PAGE

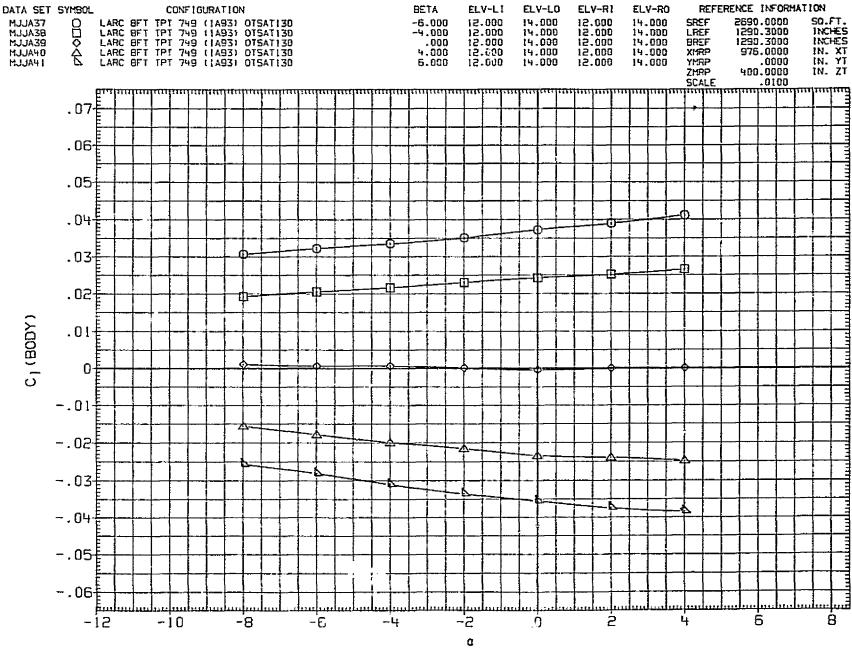


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

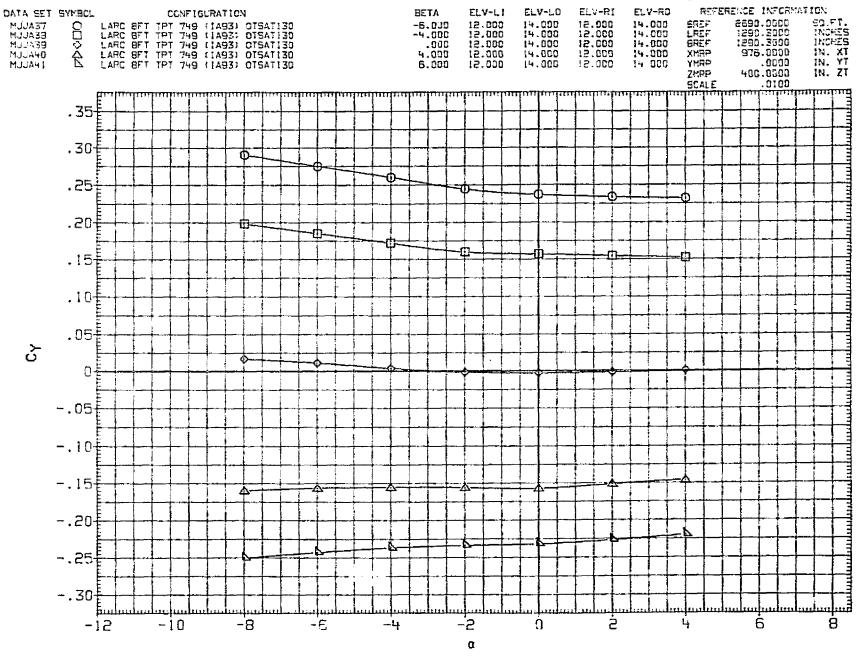


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

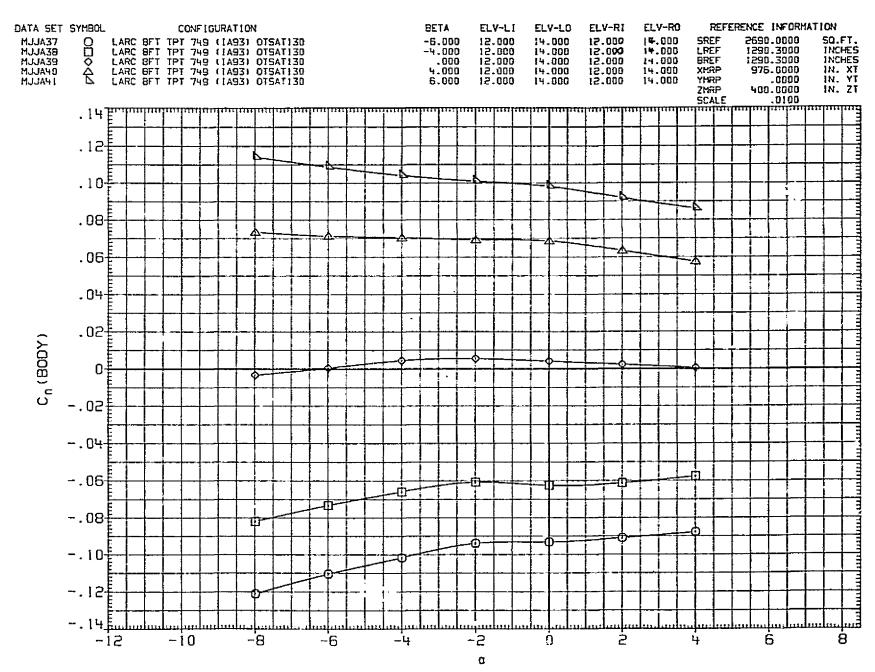


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

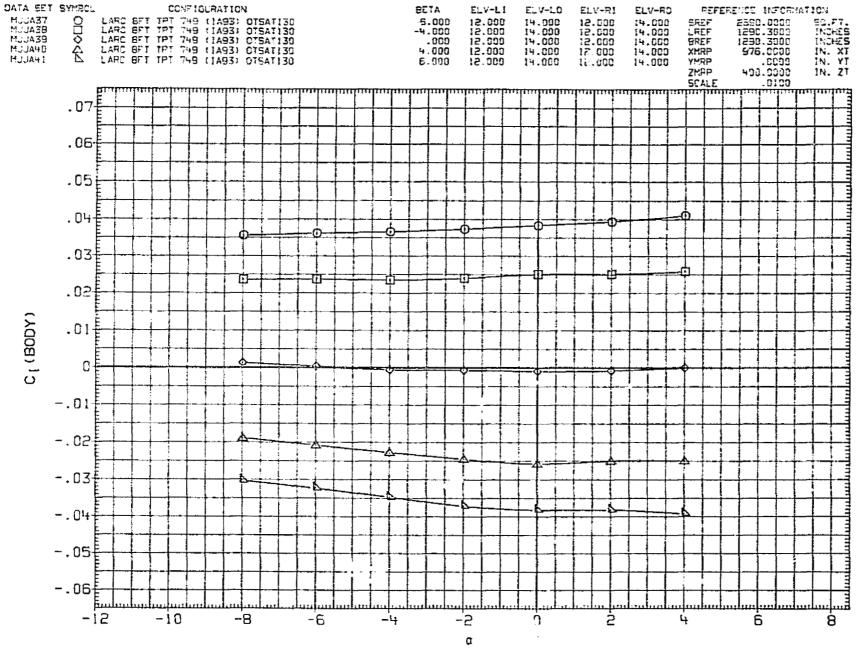


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B)MACH = .98

REPRODUCIBILITY OF THE

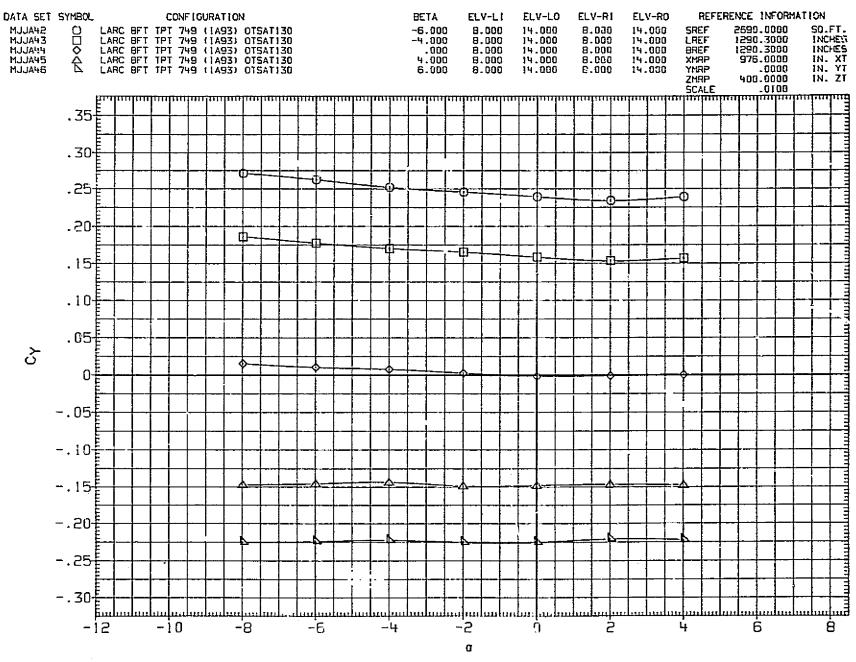


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

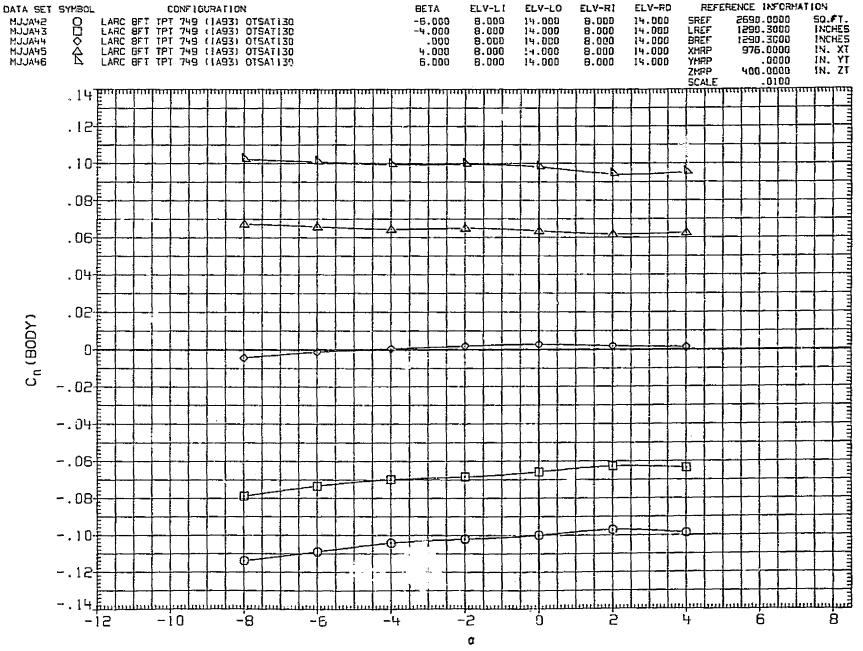


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

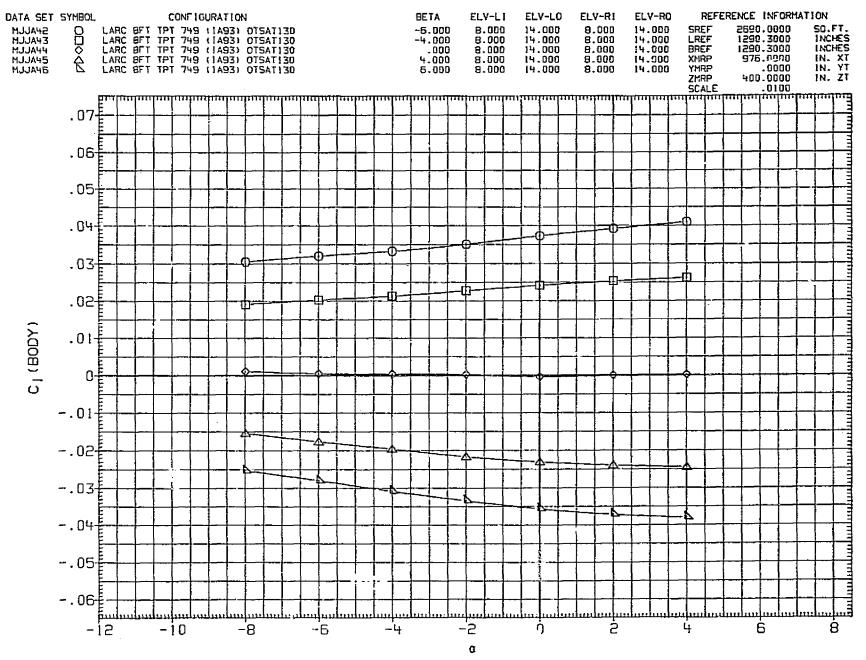
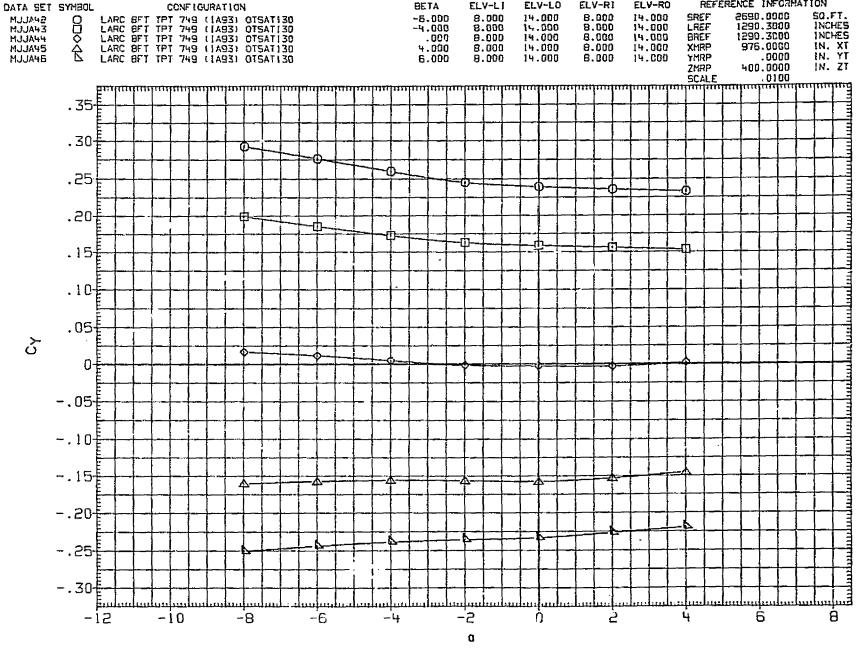


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS



BETA

ELV-L1

ELV-LO

ELV-RI

ELV-RO

LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

292

REFERENCE INFORMATION

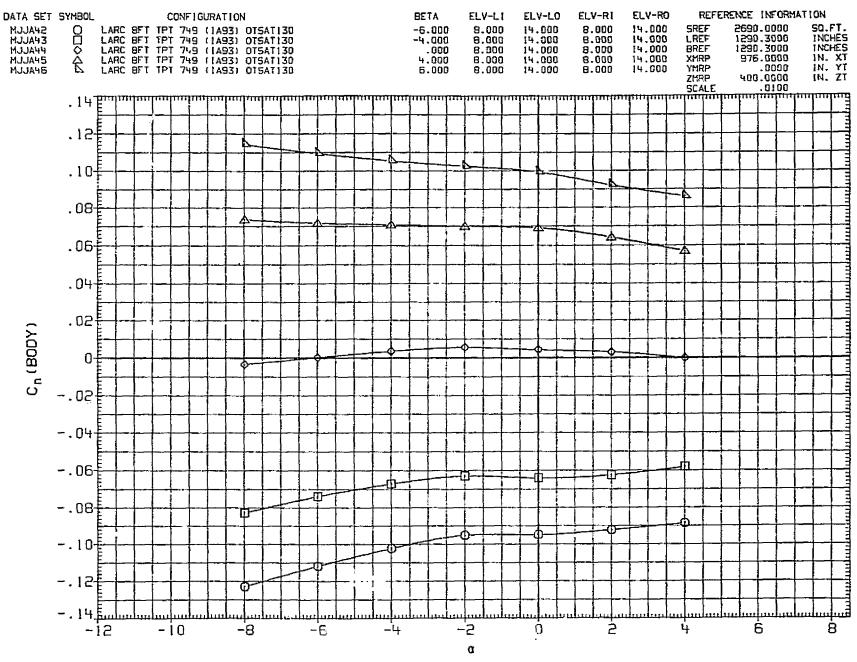


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

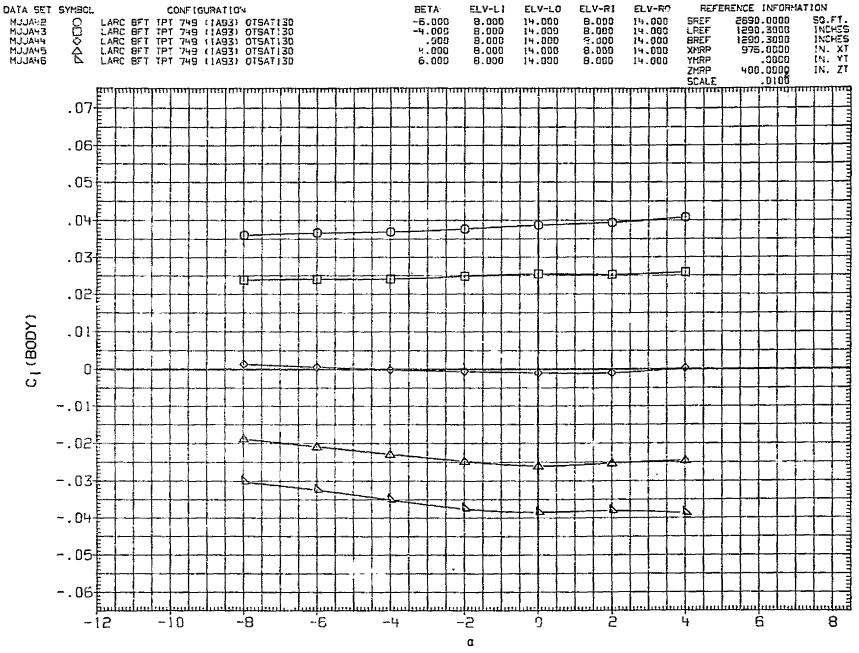


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B)MACH = .98

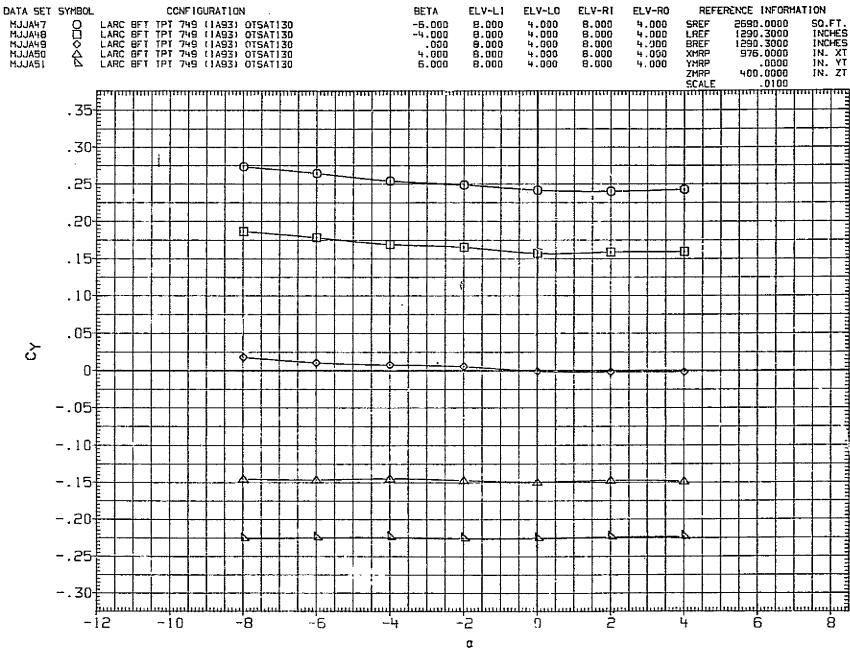


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(A) MACH = .90 PAGE 295

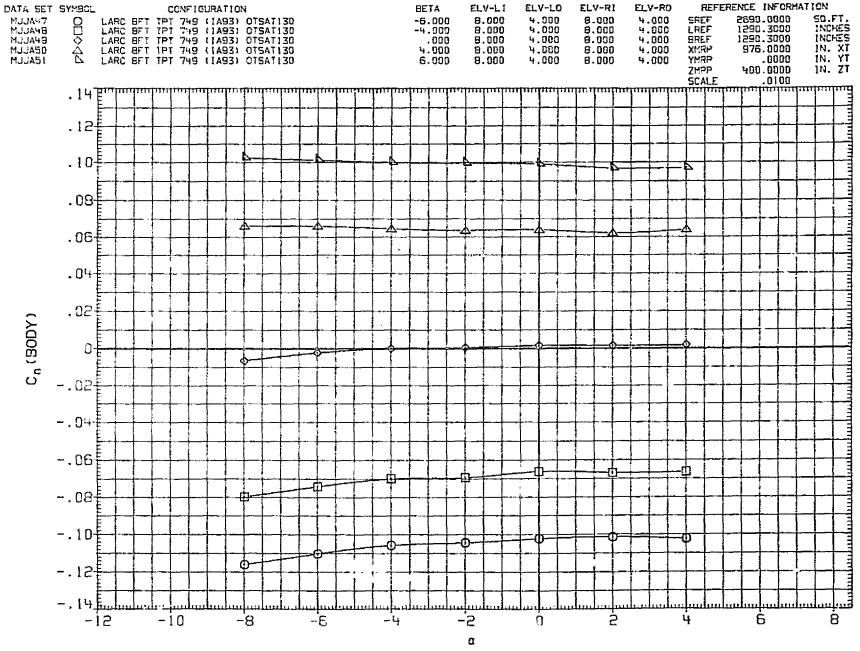


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

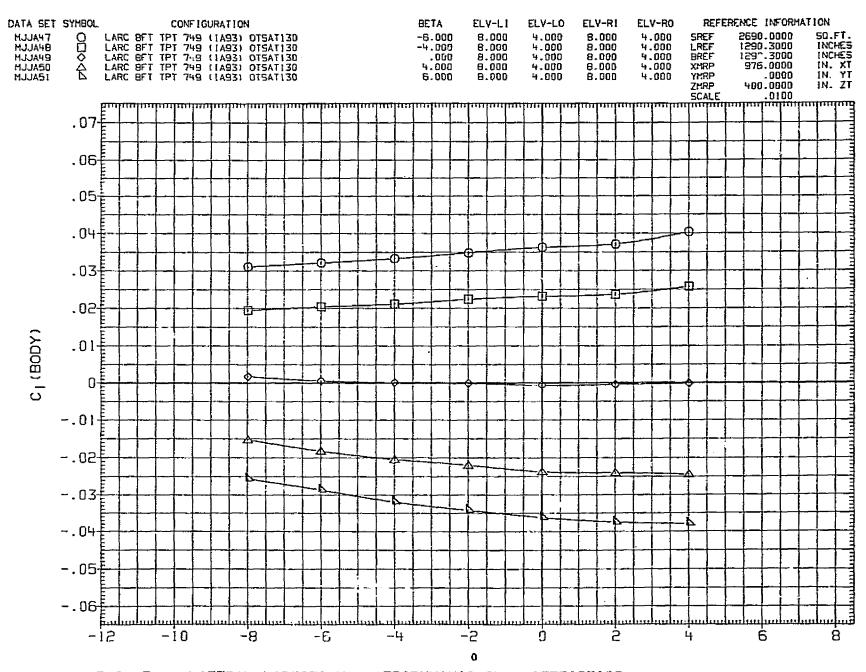


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

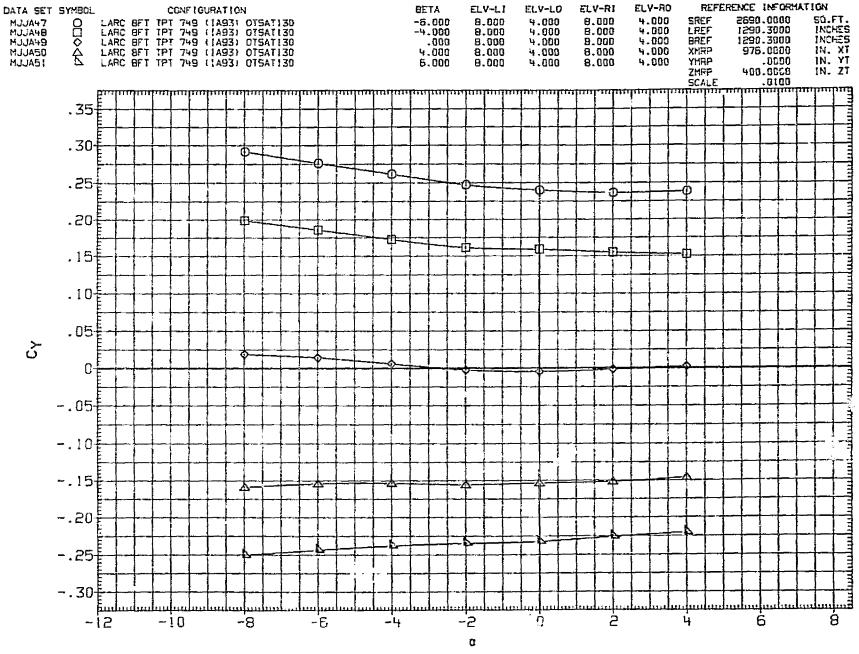


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

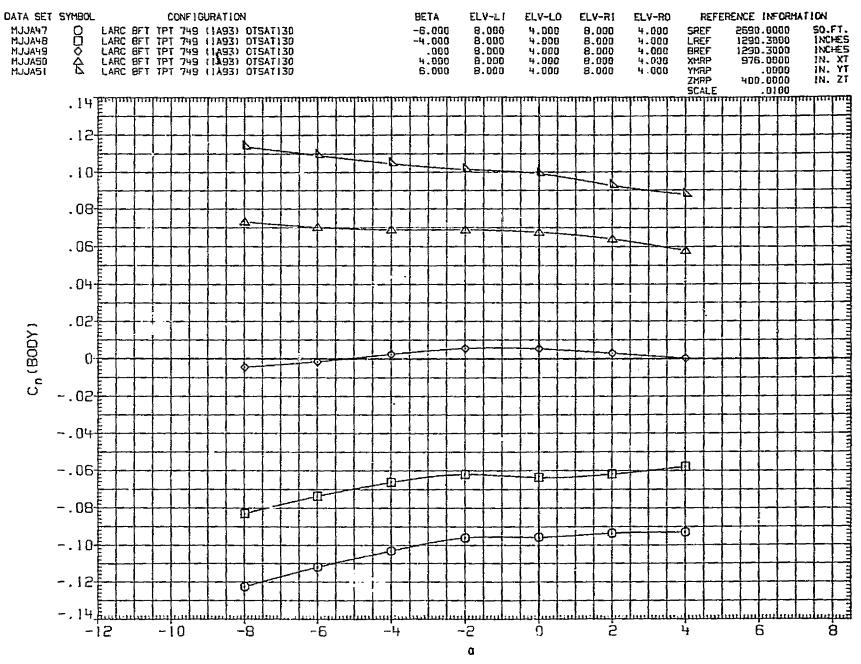


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

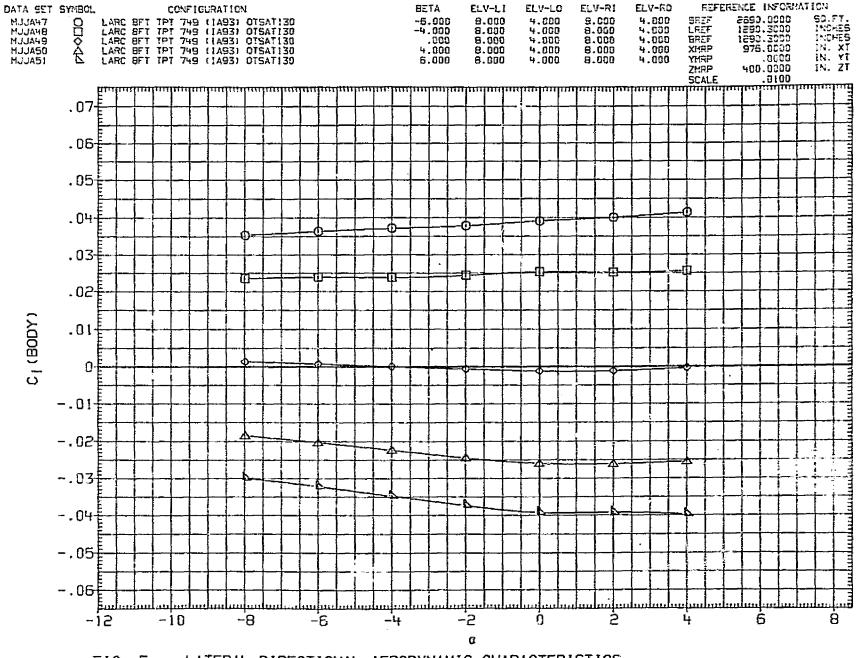
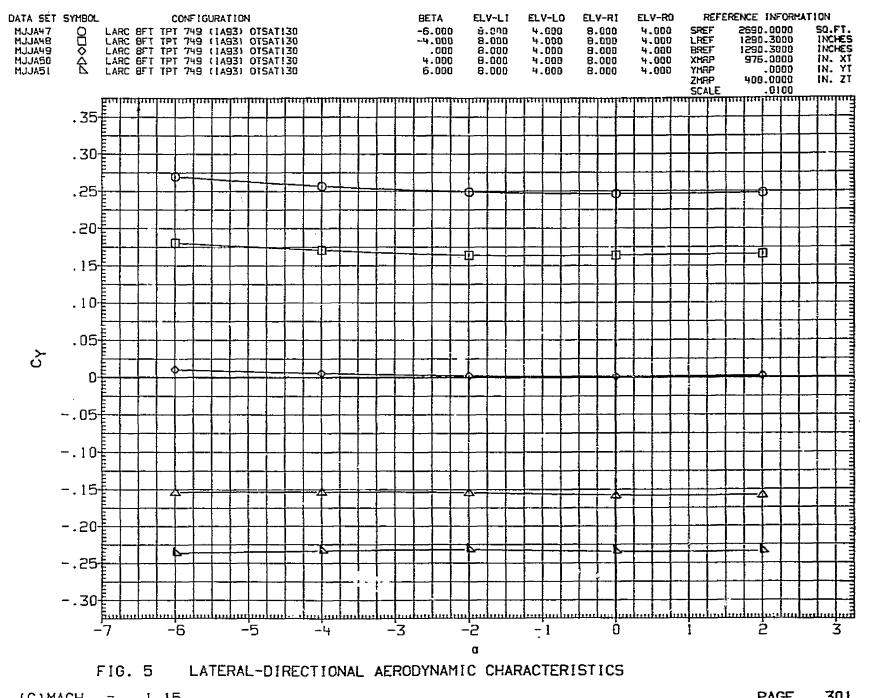


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B) MACH = .98 PAGE 300



LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS FIG. 5

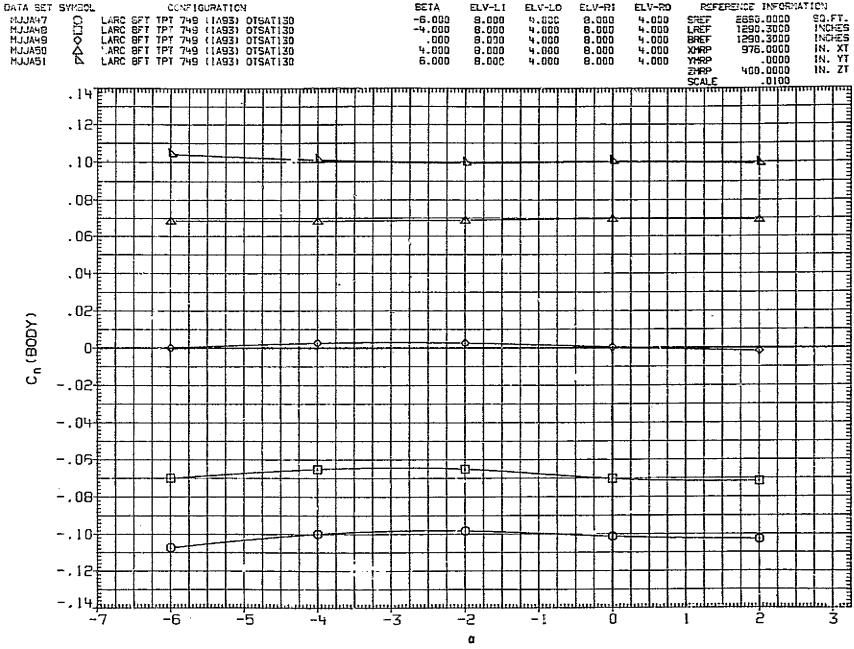


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

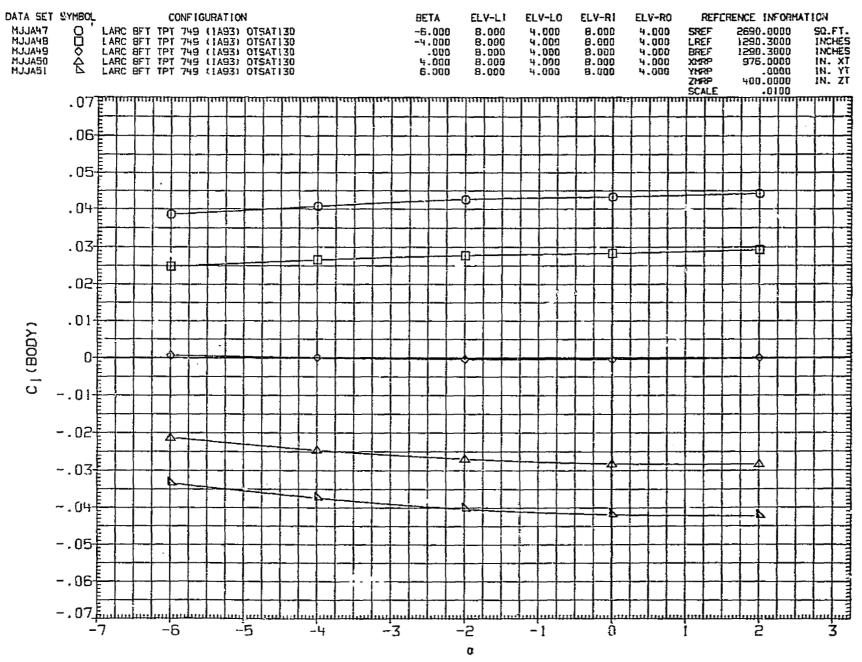


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(C)MACH = 1.15

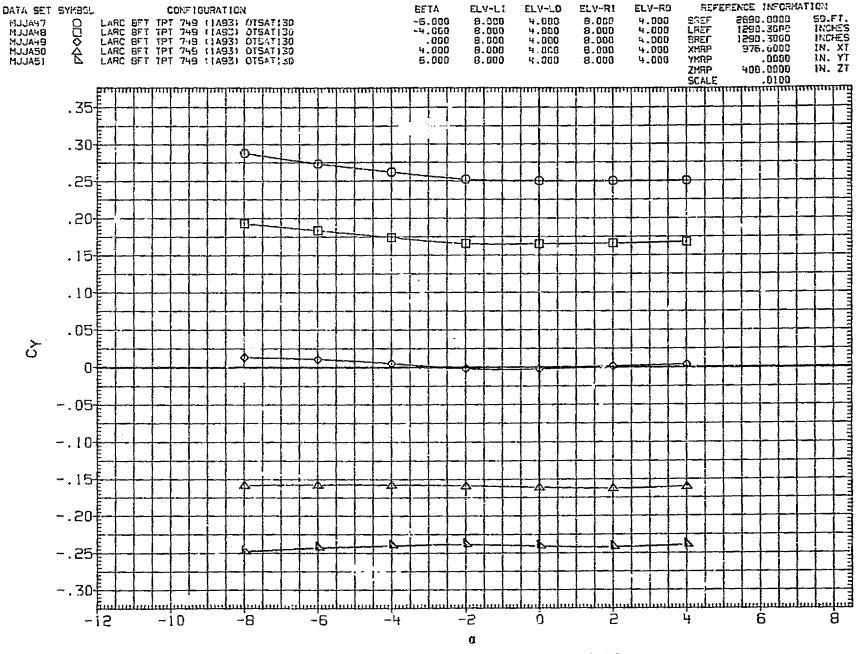


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20 PAGE 304

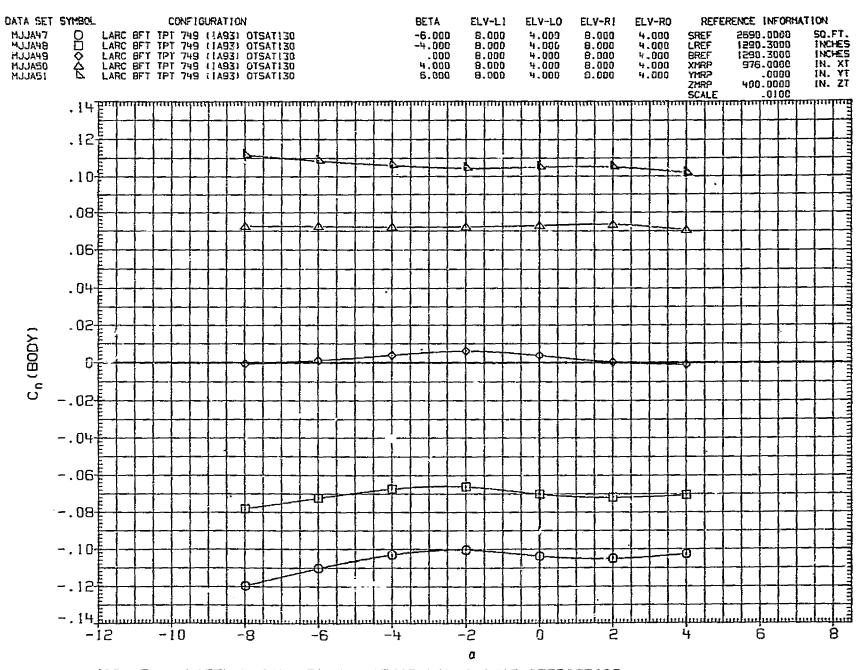


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

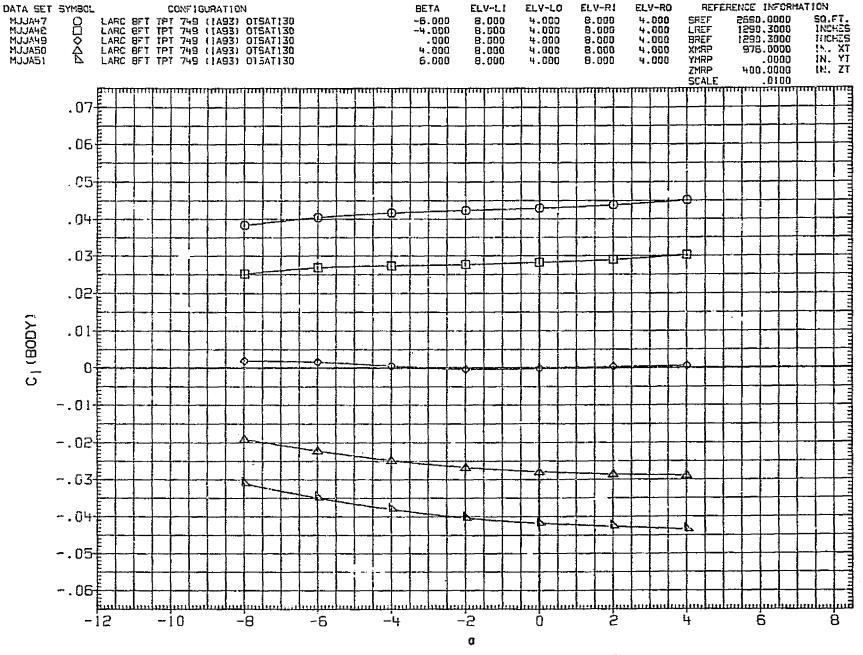


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20

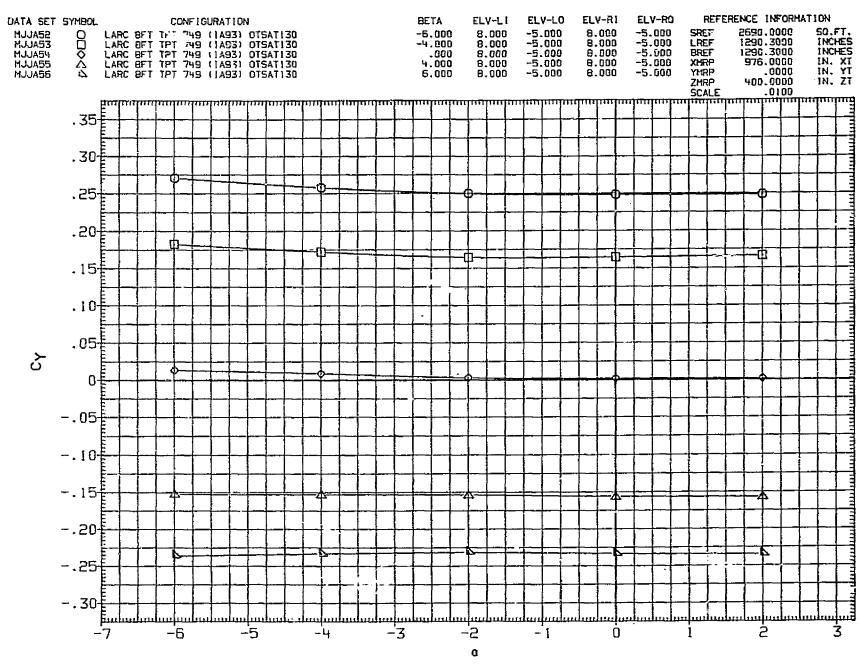
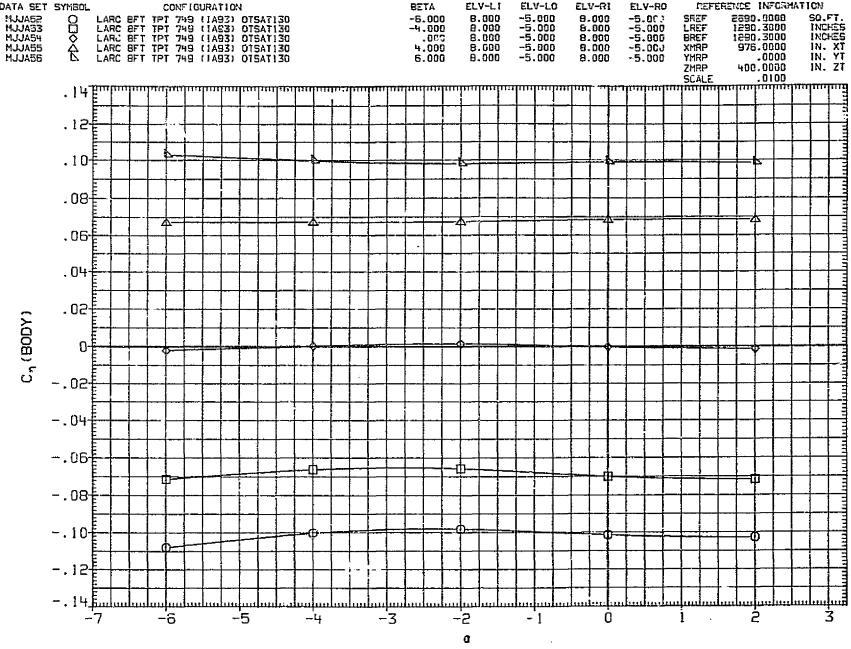


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS



BETA

ELV-LI

ELV-LO

ELV-RI ELV-RO

REFERENCE INFORMATION

LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS FIG. 5

(A)MACH 1.15

DATA SET SYMBOL

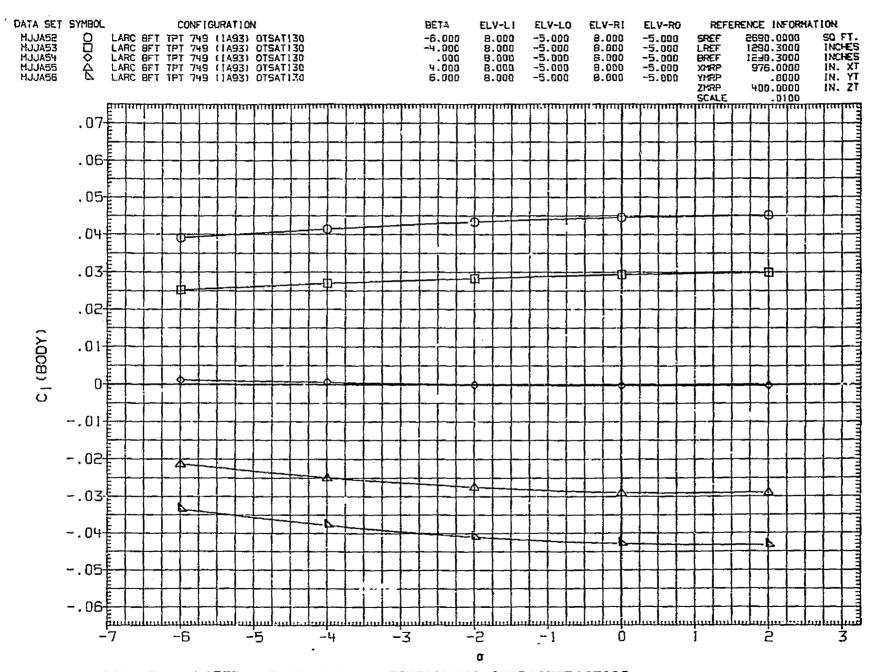


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

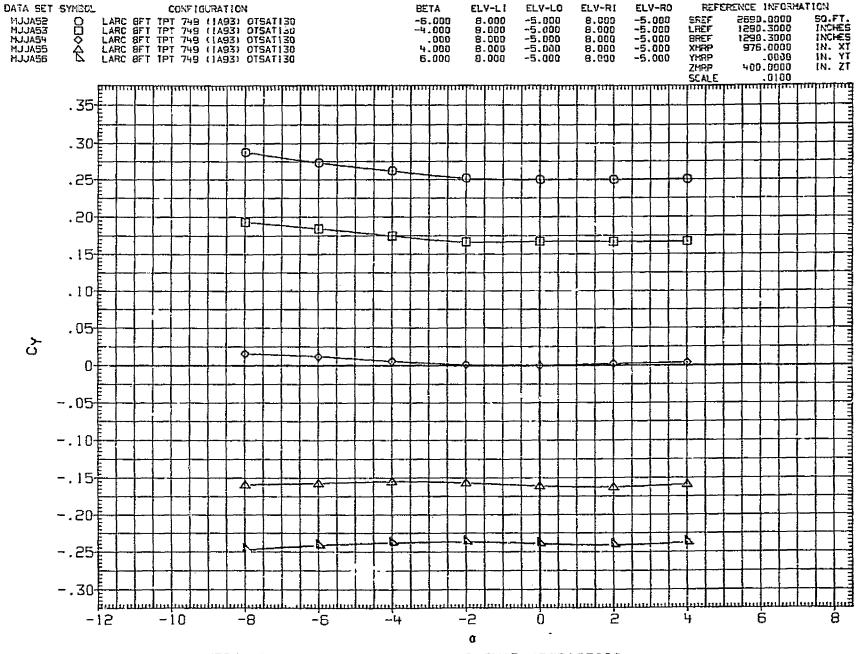


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

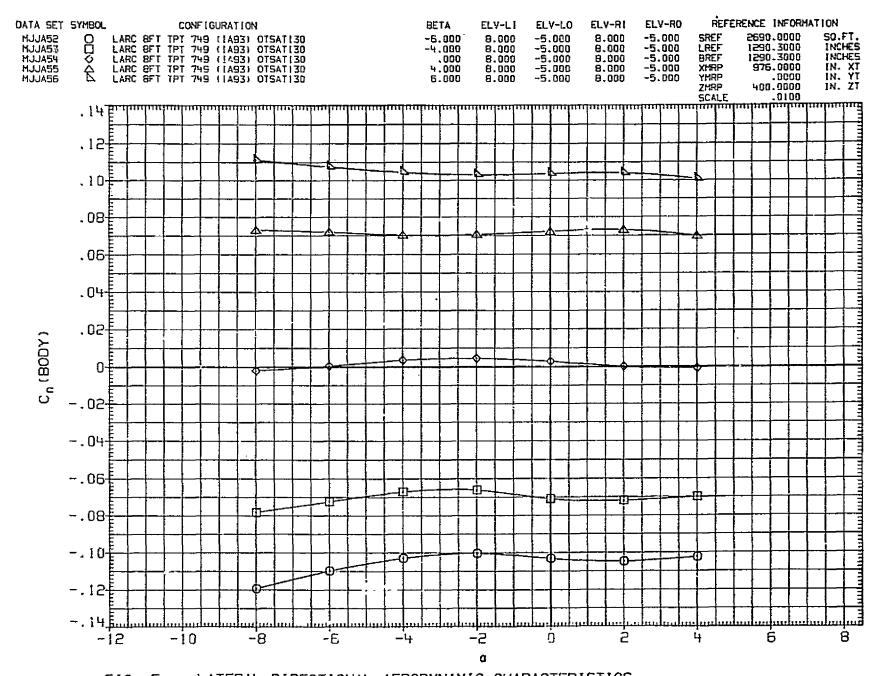


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(3) MACH = 1.20 PAGE

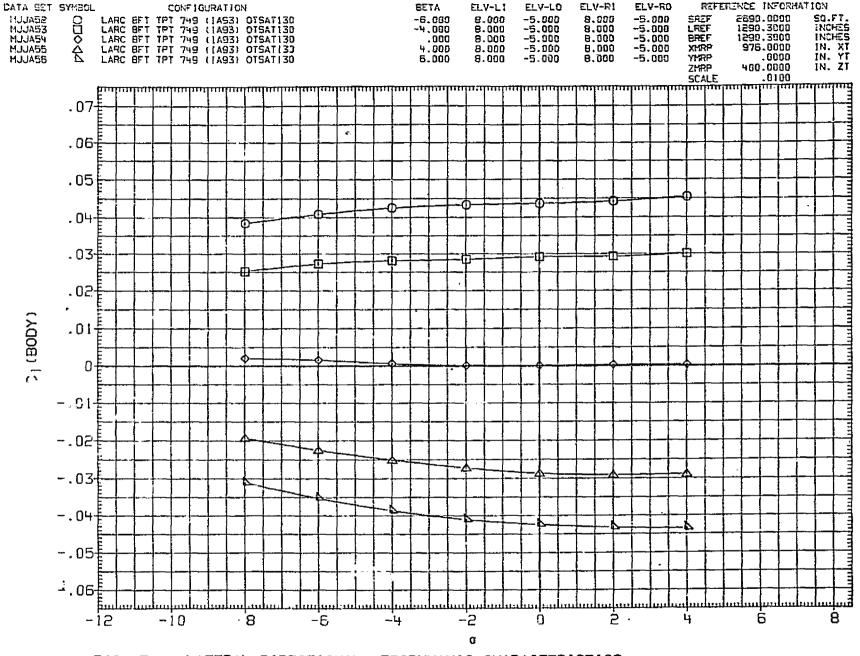


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

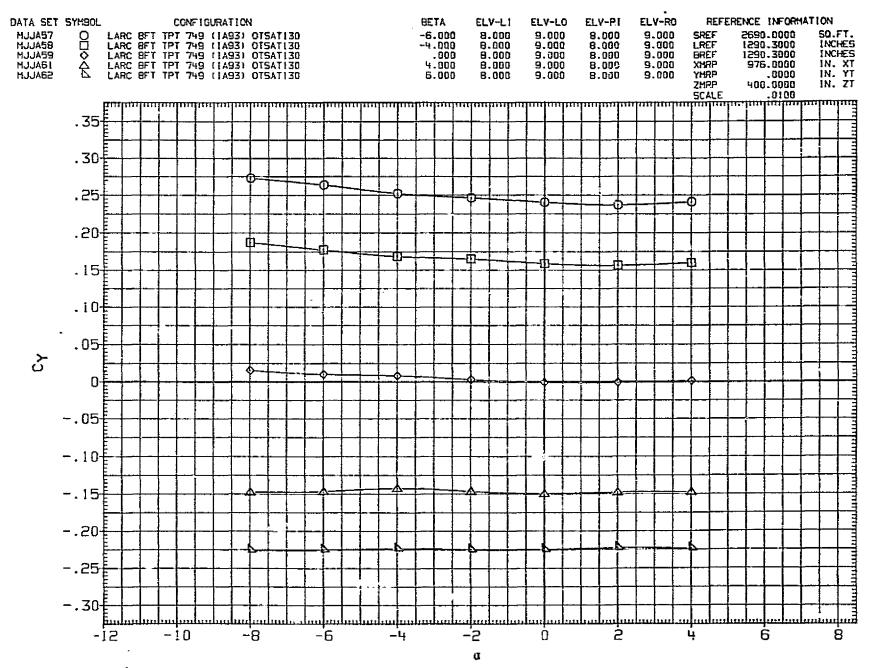


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

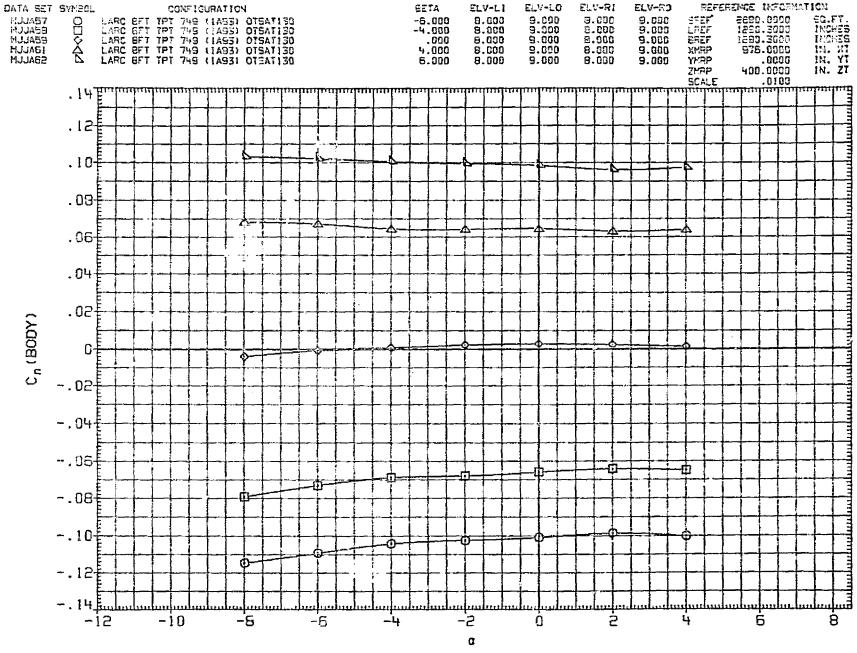


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

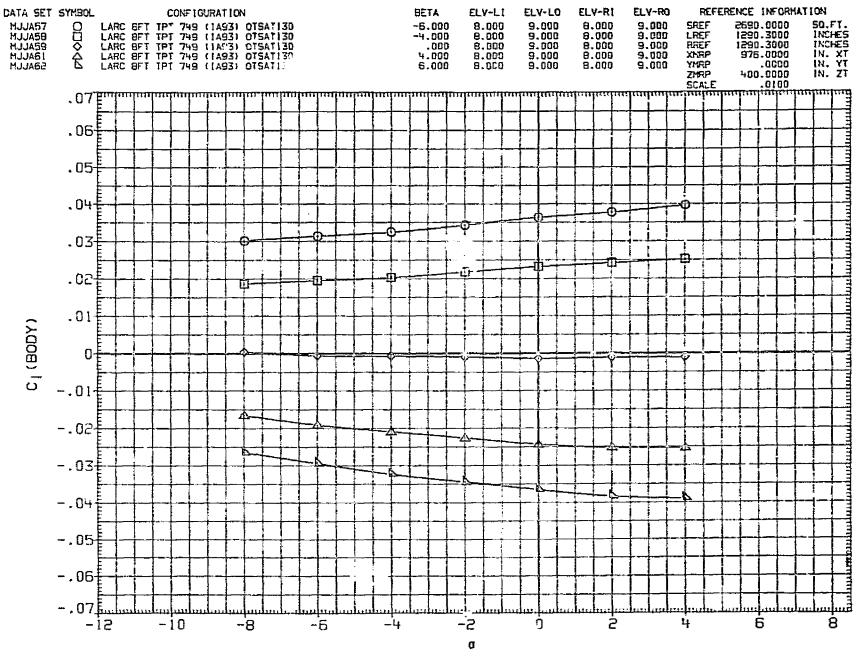


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

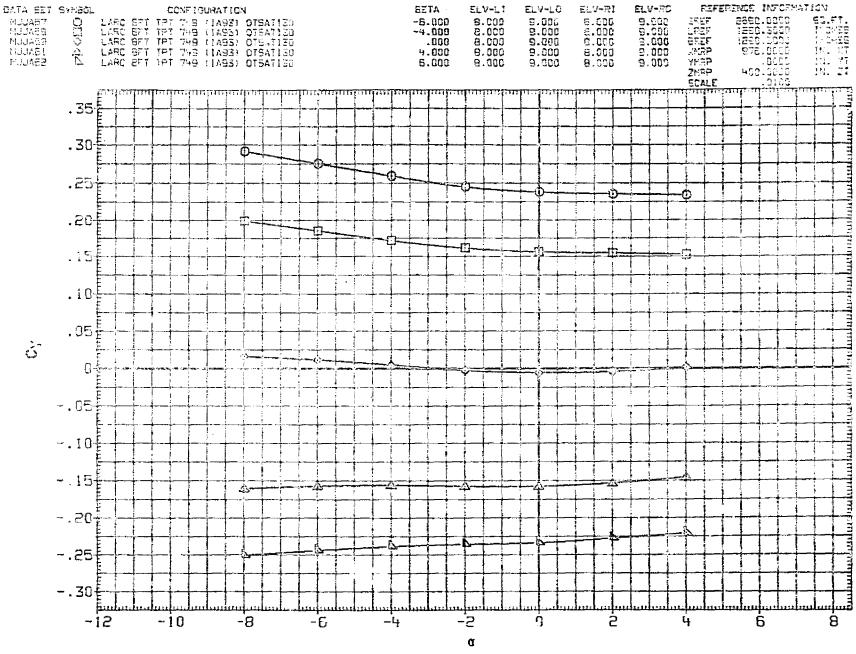


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(B) MACH = .98 PAGE 316

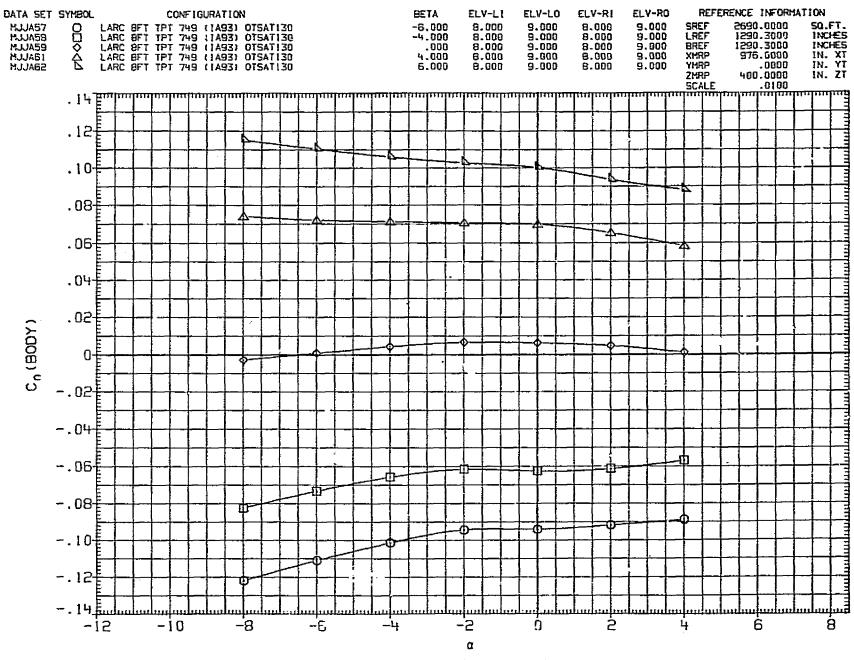


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

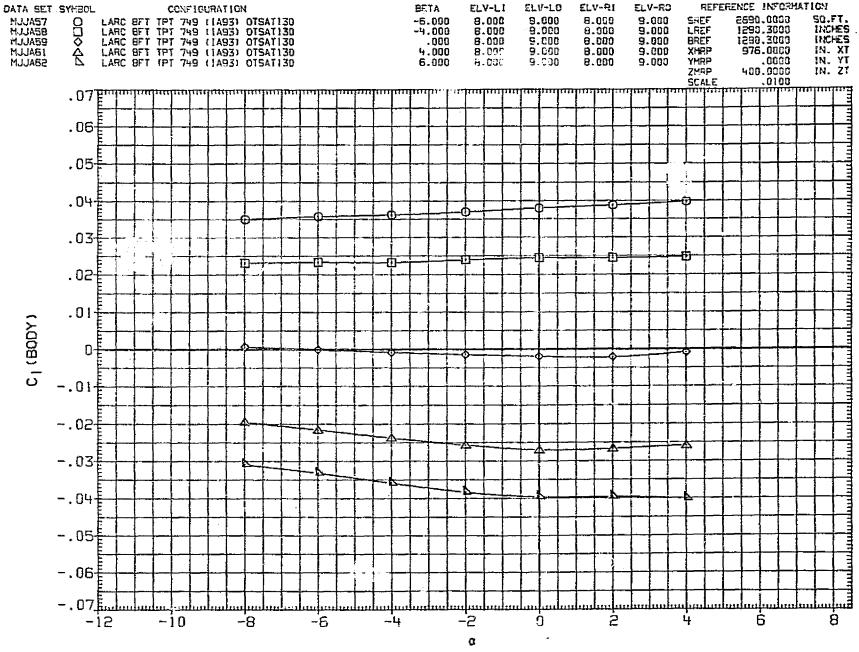


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

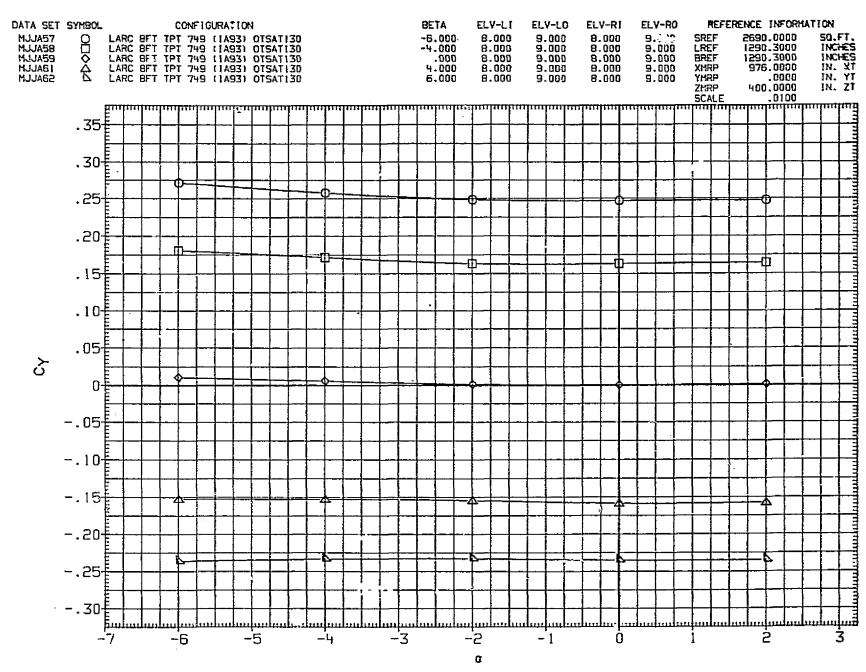


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

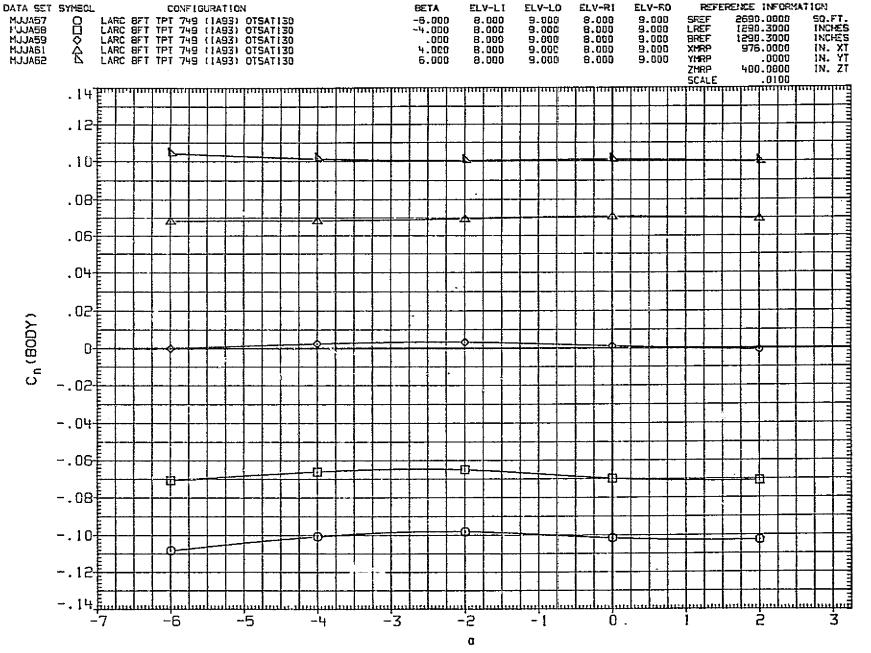


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(C)MACH = 1.15 PAGE

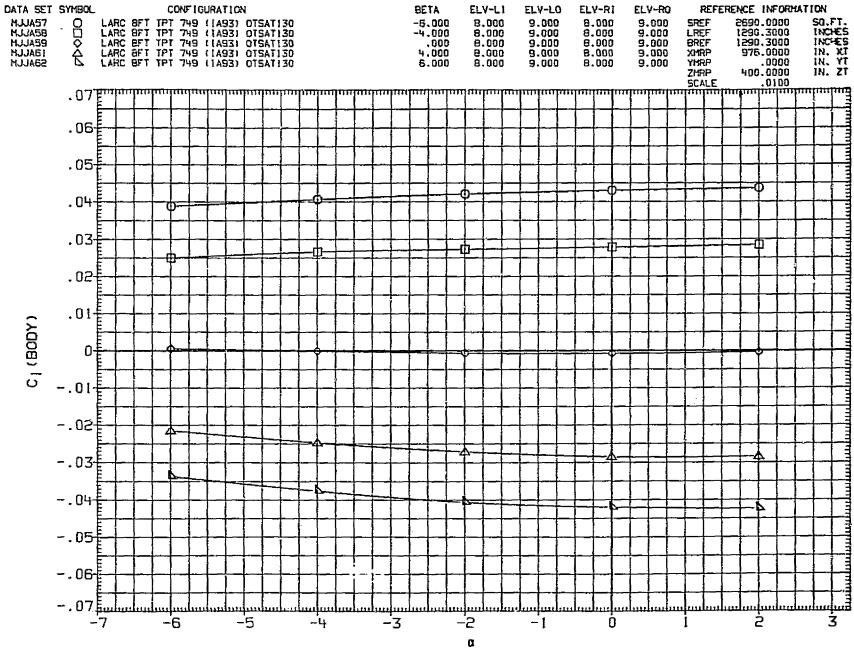


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

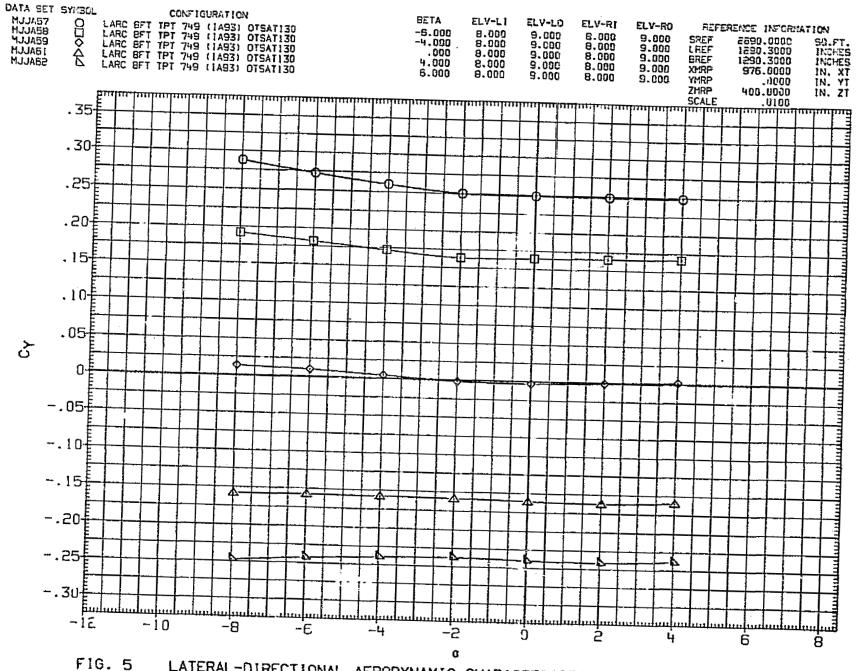


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20

PAGE 322

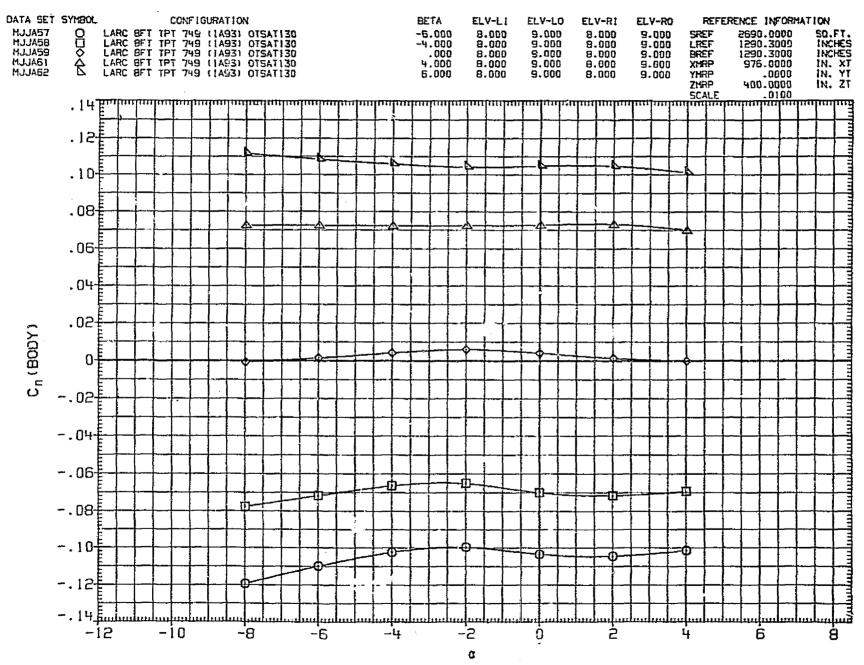


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(D)MACH = 1.20

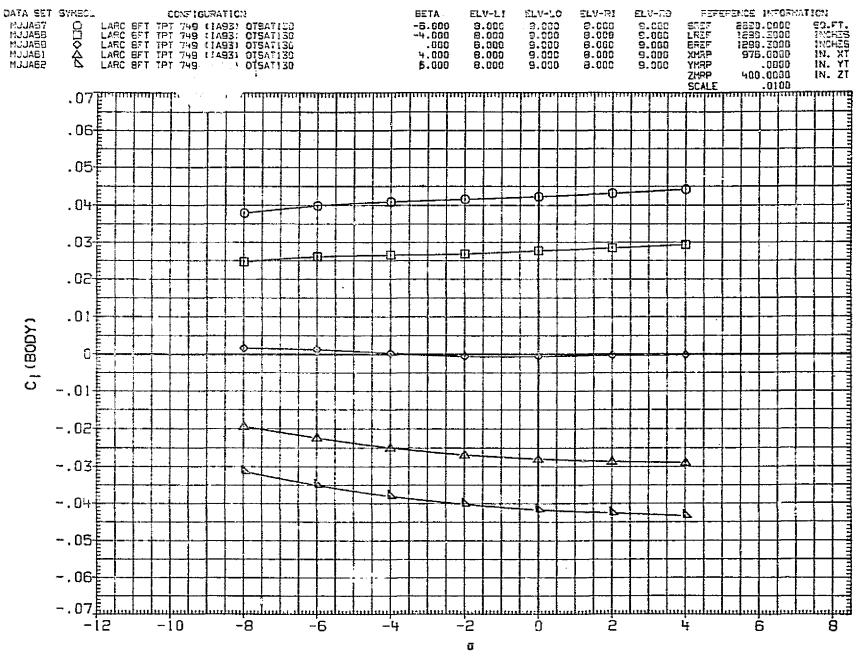


FIG. 5 LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS

(D) MACH = 1.20 PAGE 324

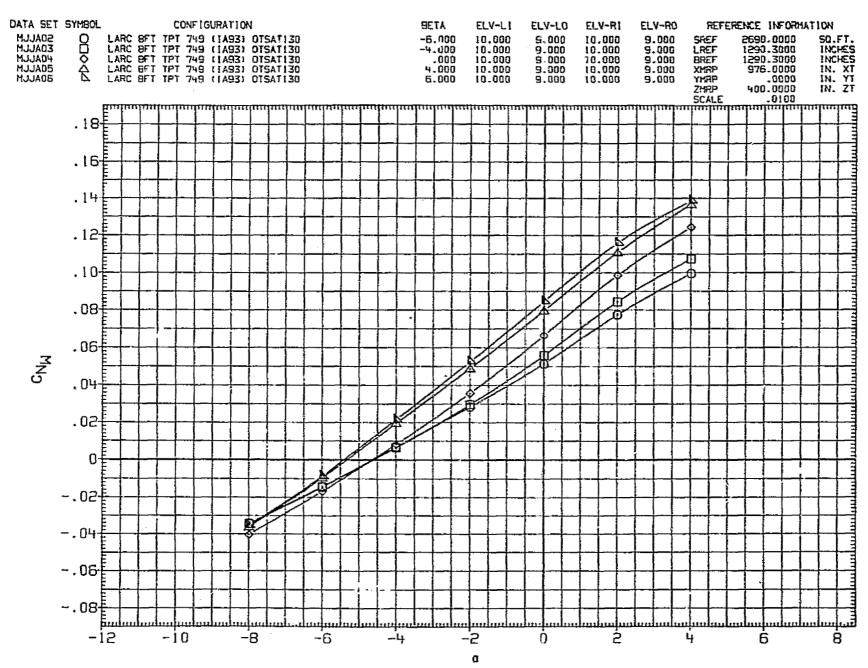


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A)MACH = .90

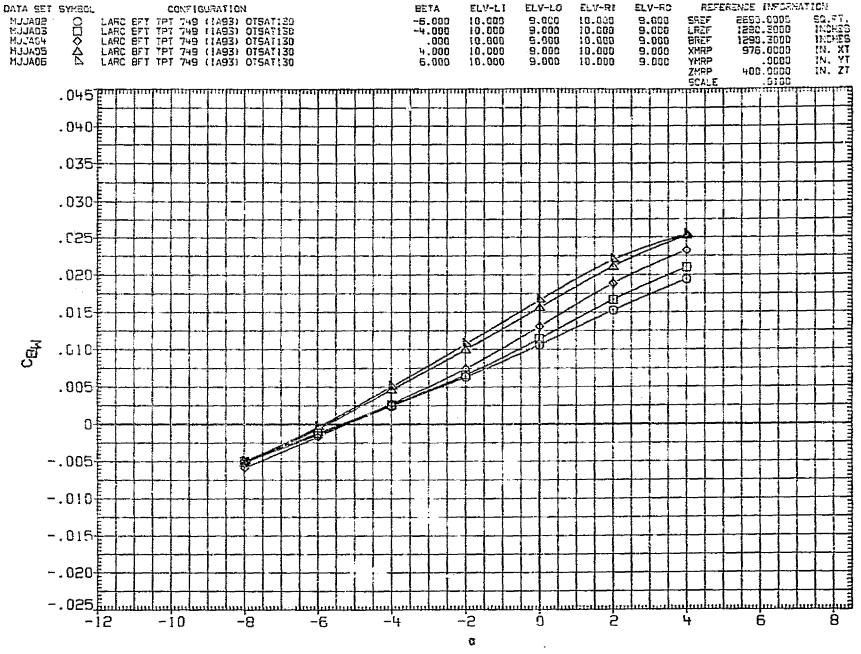


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

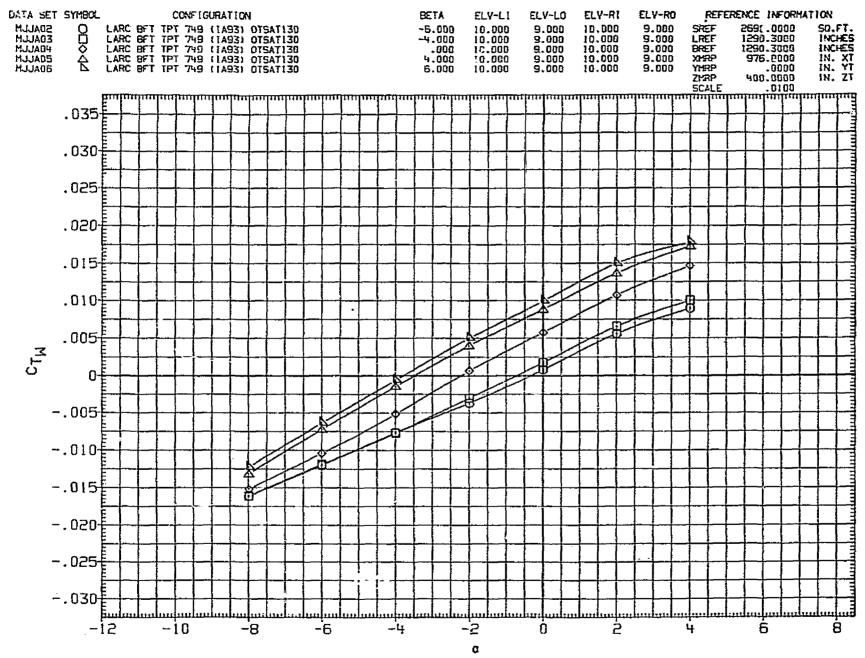


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A)MACH = .90

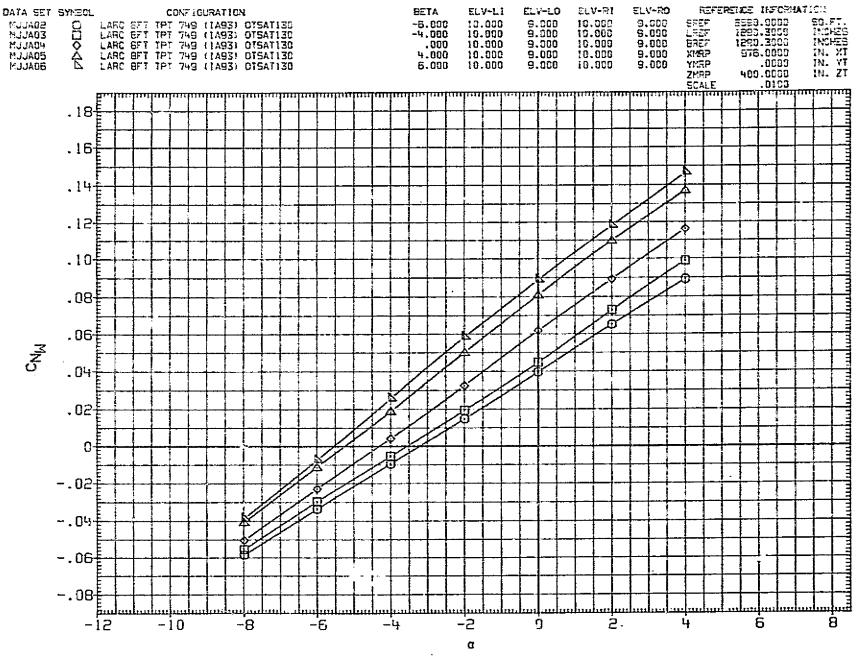


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

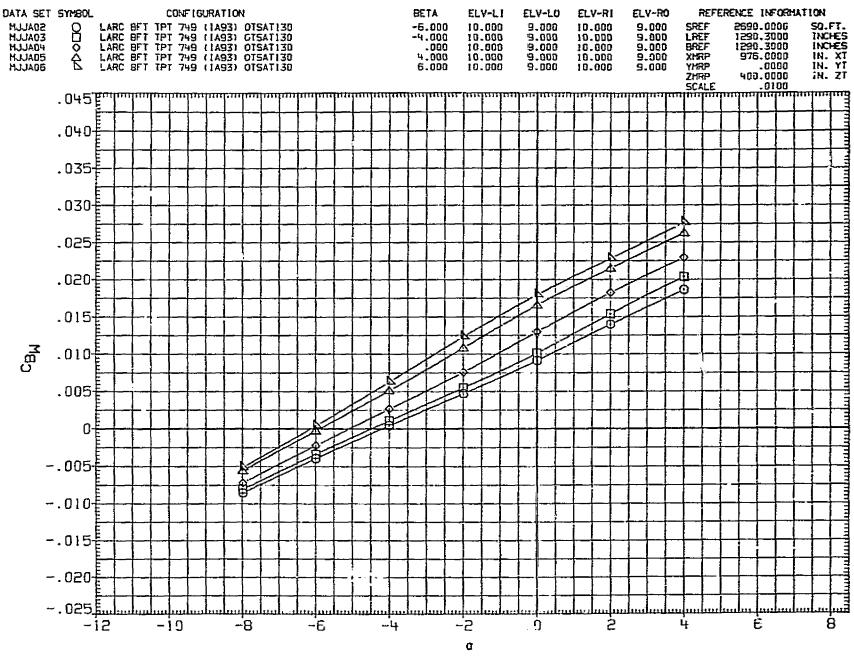
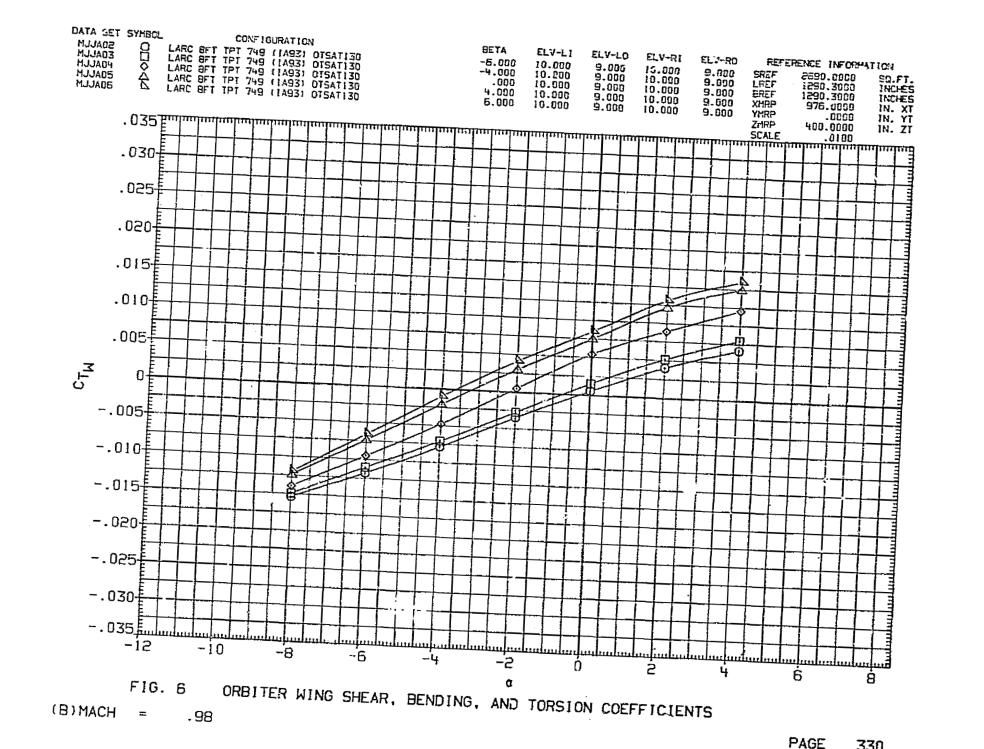


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

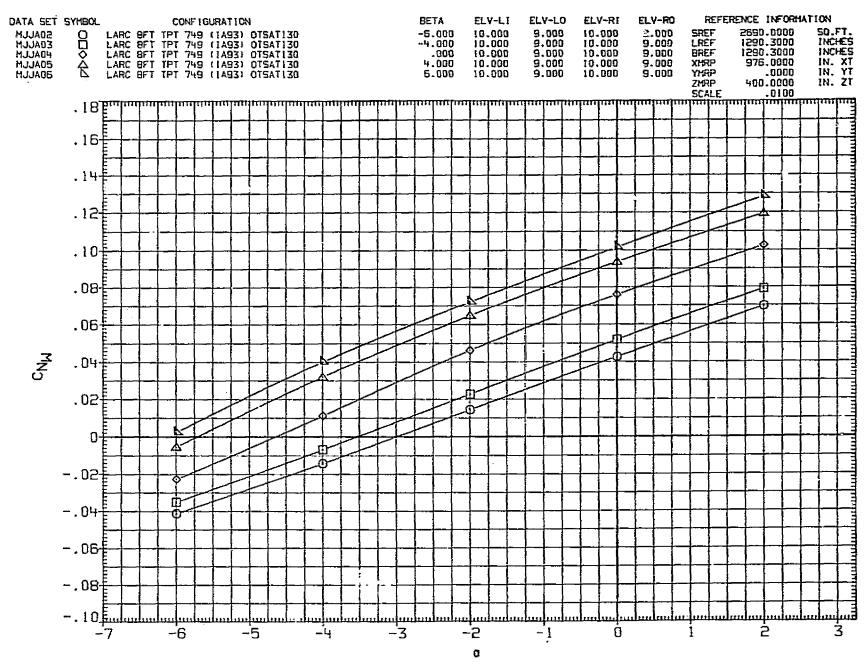


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

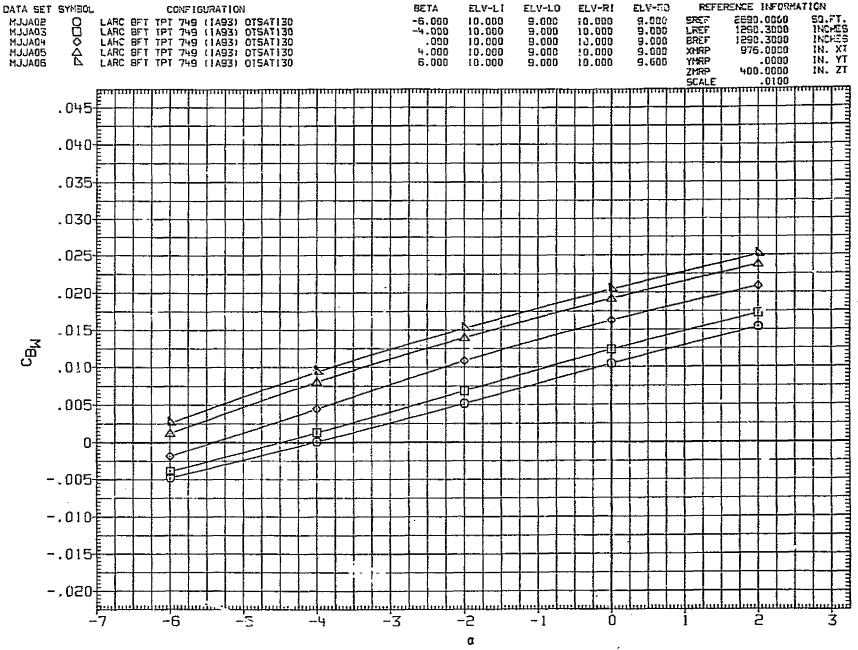
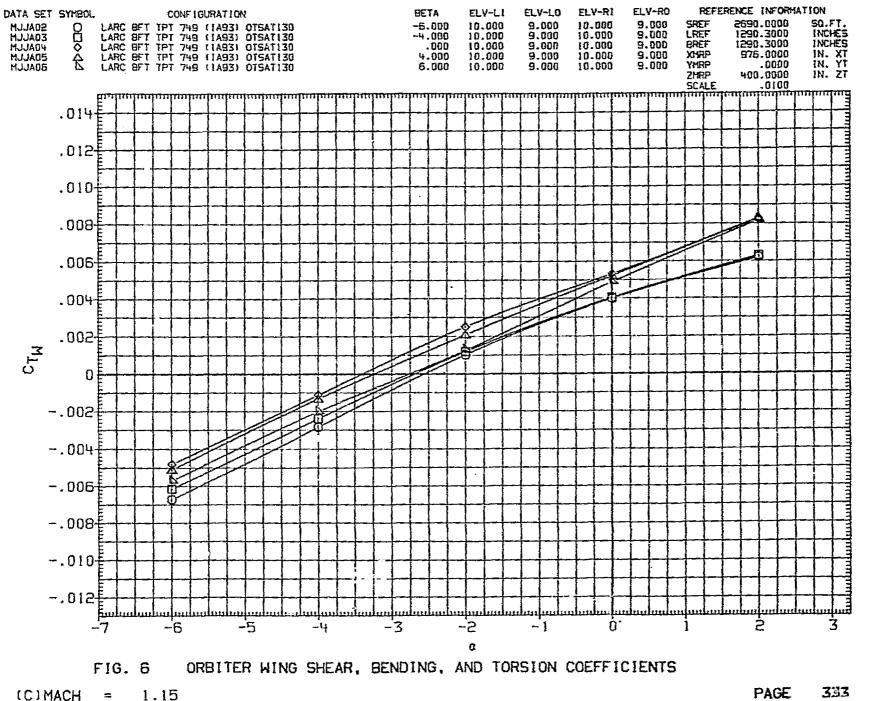


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(C)MACH = 1.15



ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS FIG. 6

PAGE 333 (C) MACH 1.15



FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

334

(D)MACH = 1.20

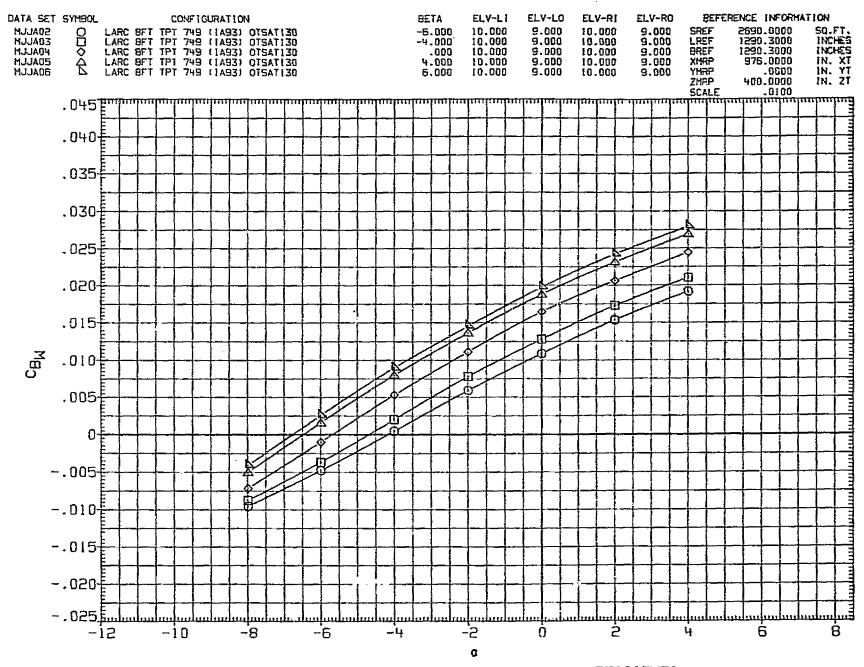


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

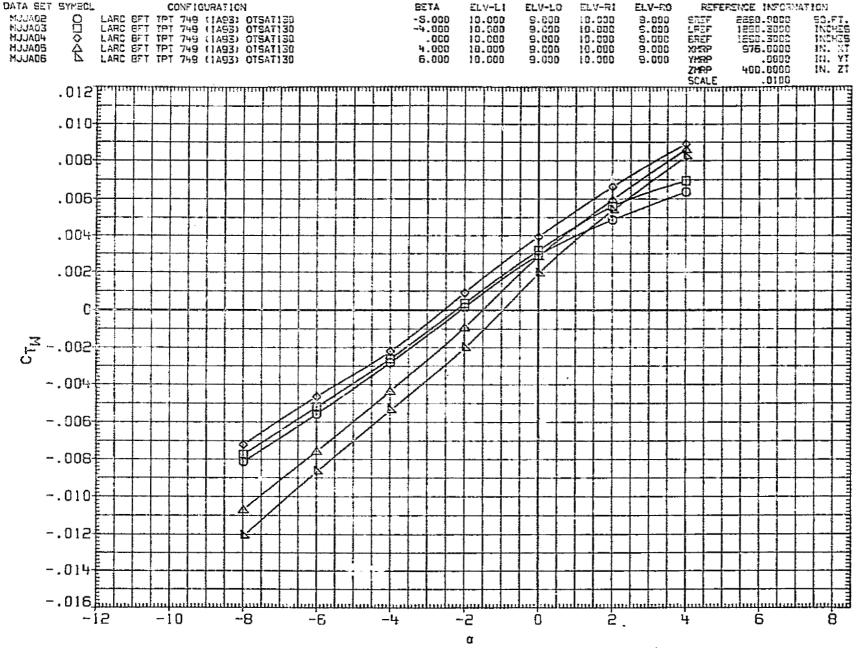


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(D)MACH = 1.20 PAGE 336

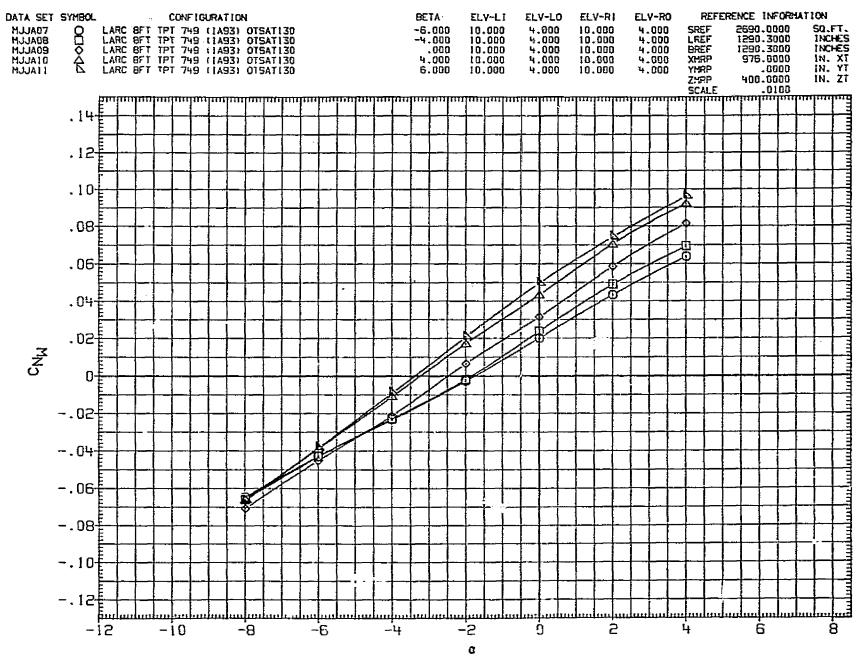


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

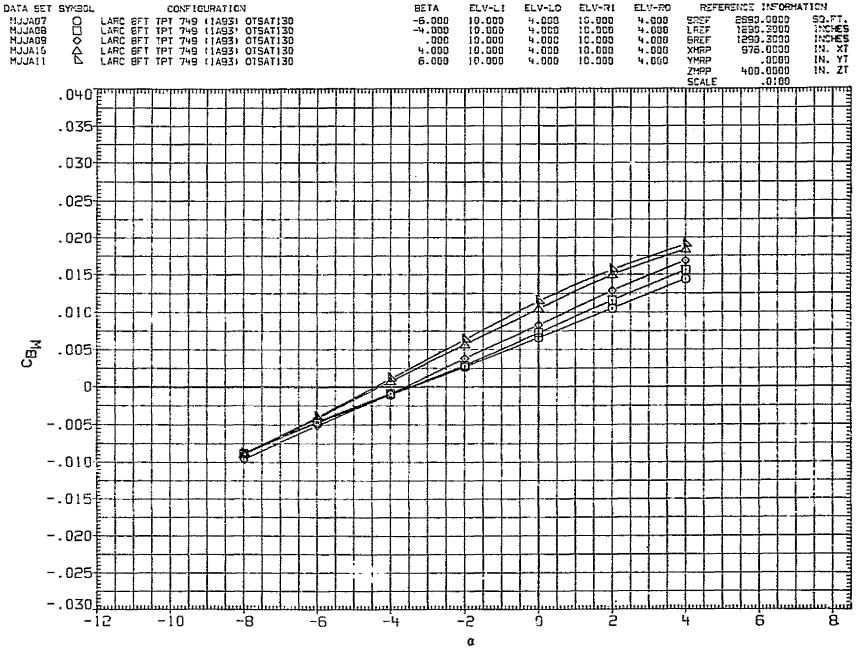


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A)MACH = .90

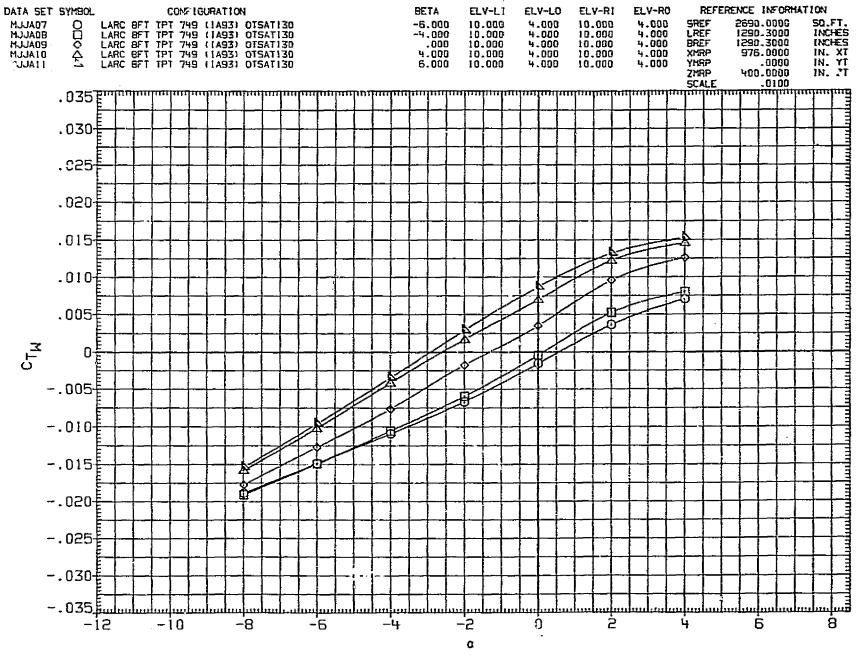


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

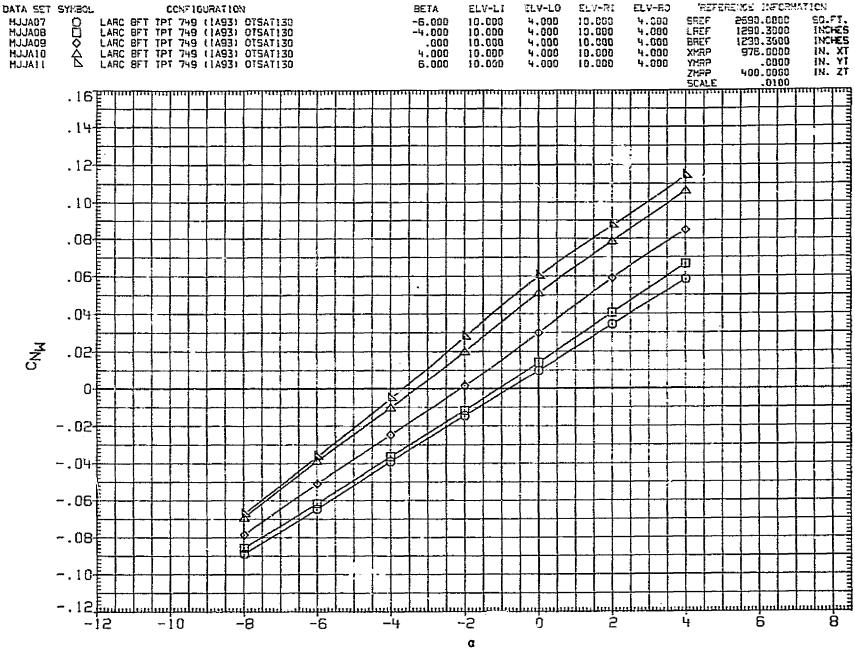


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

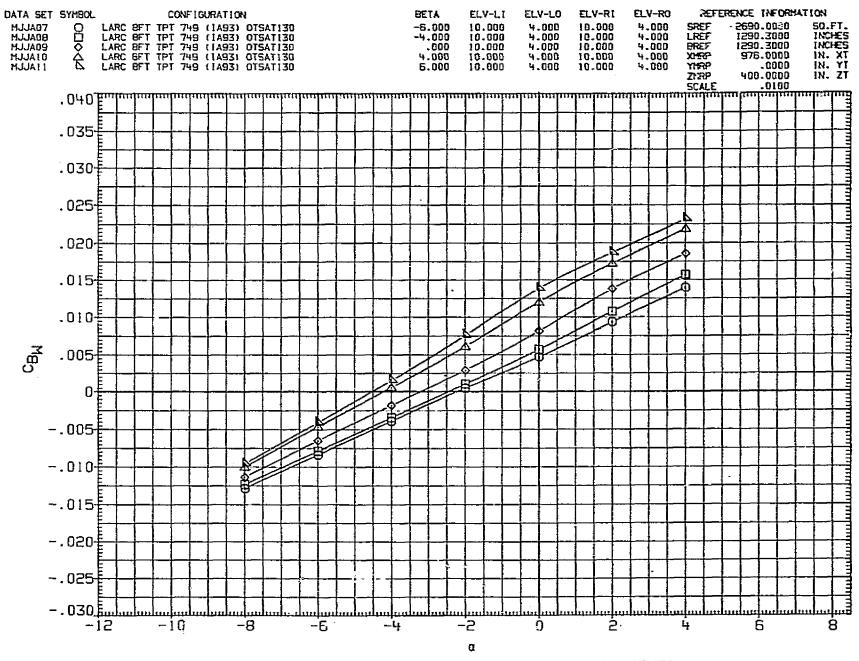


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(B)MACH = .98

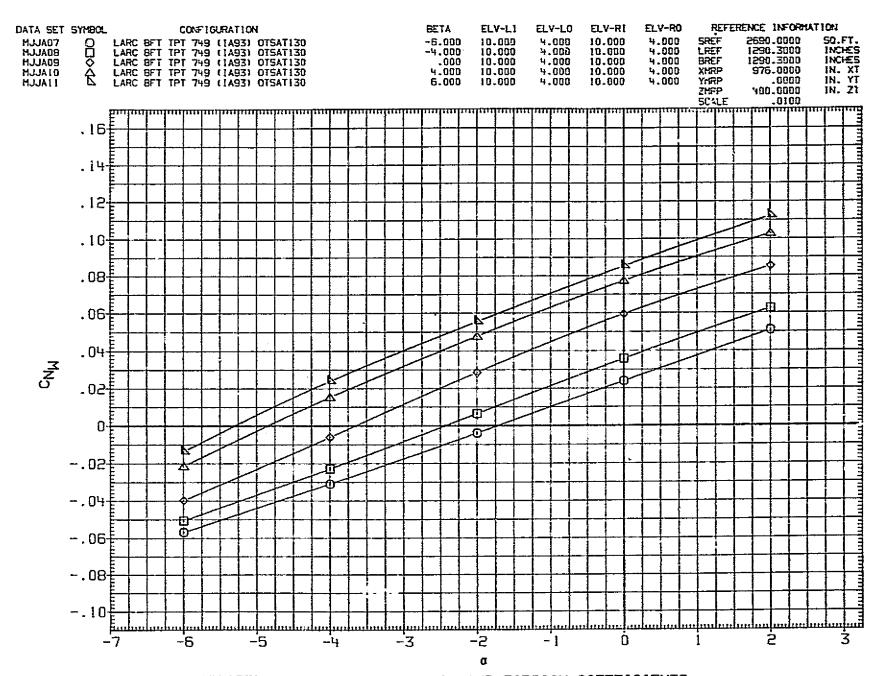
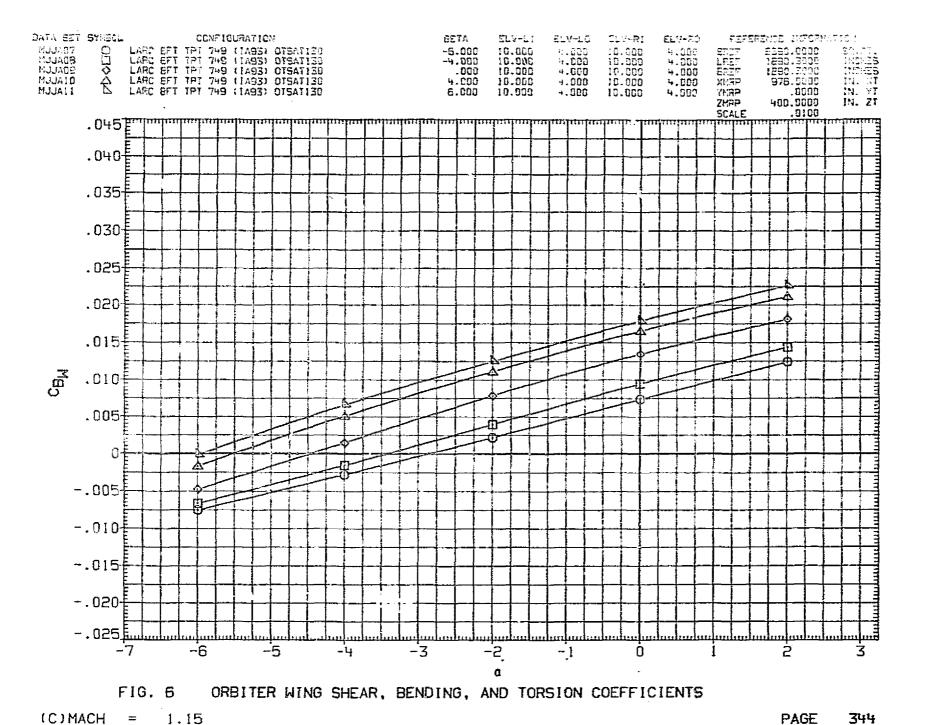


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



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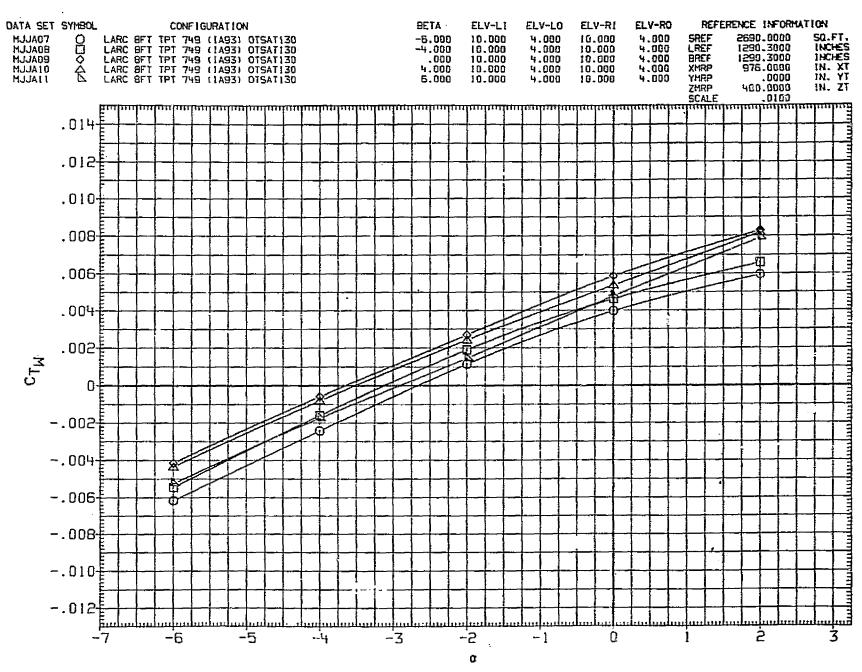


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

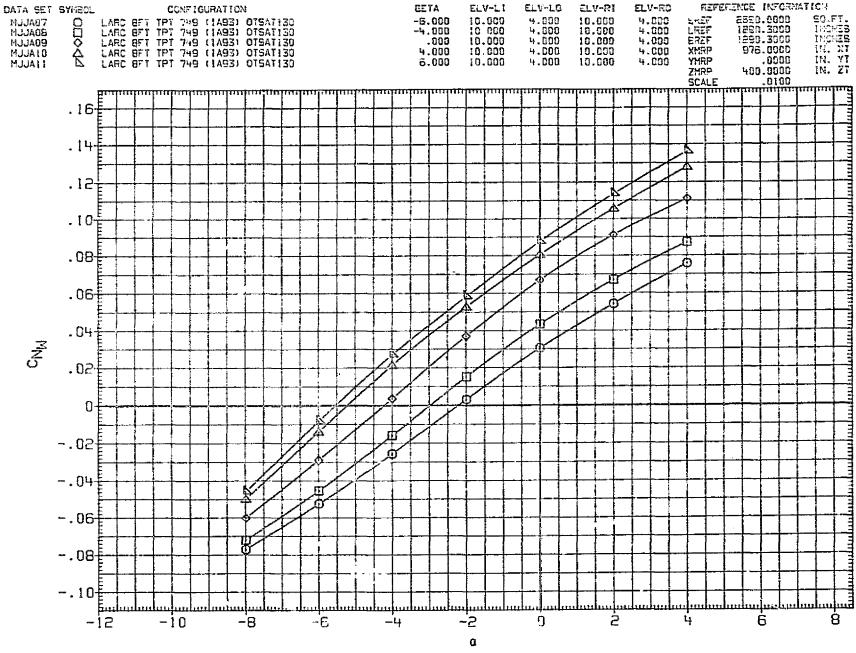


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(D)MACH = 1.20

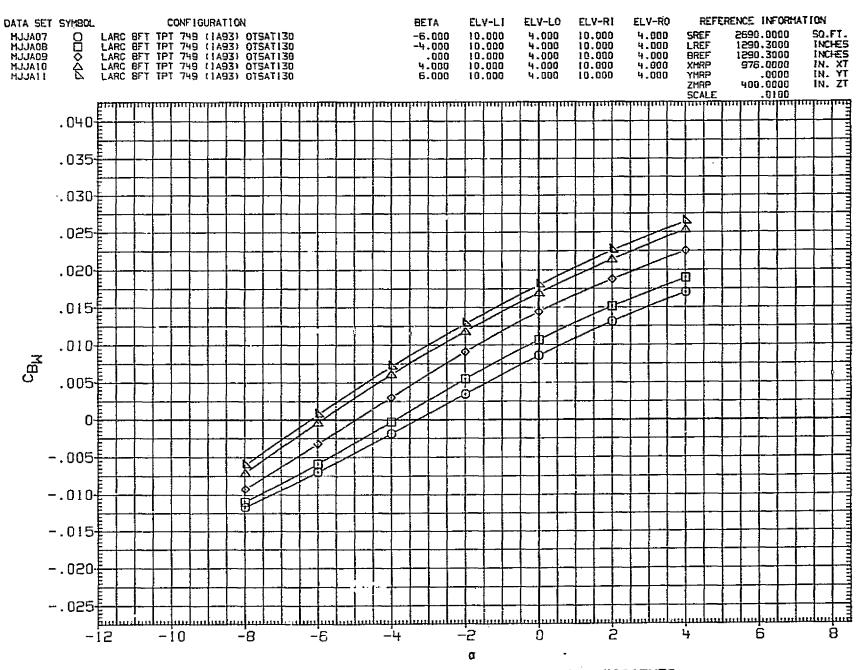


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

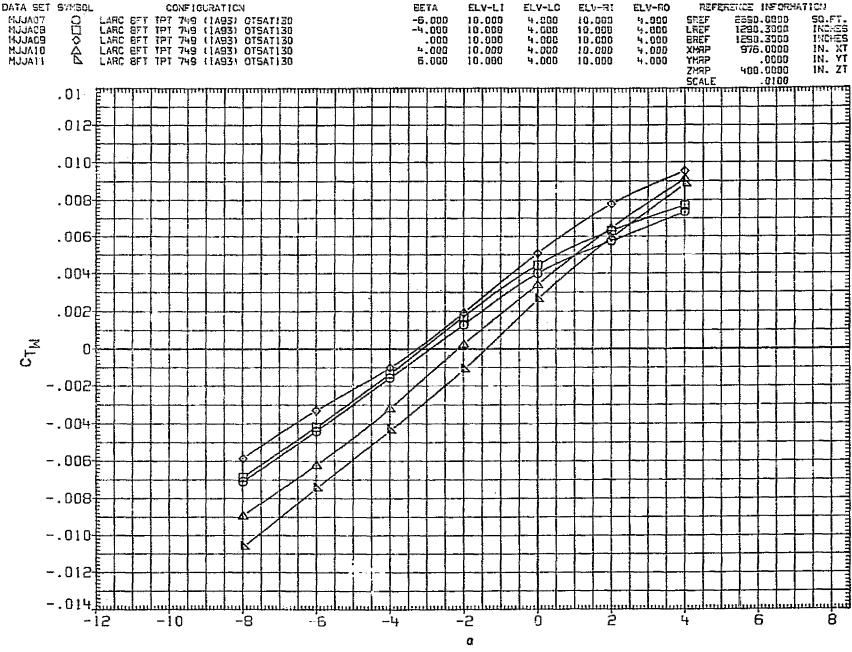


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

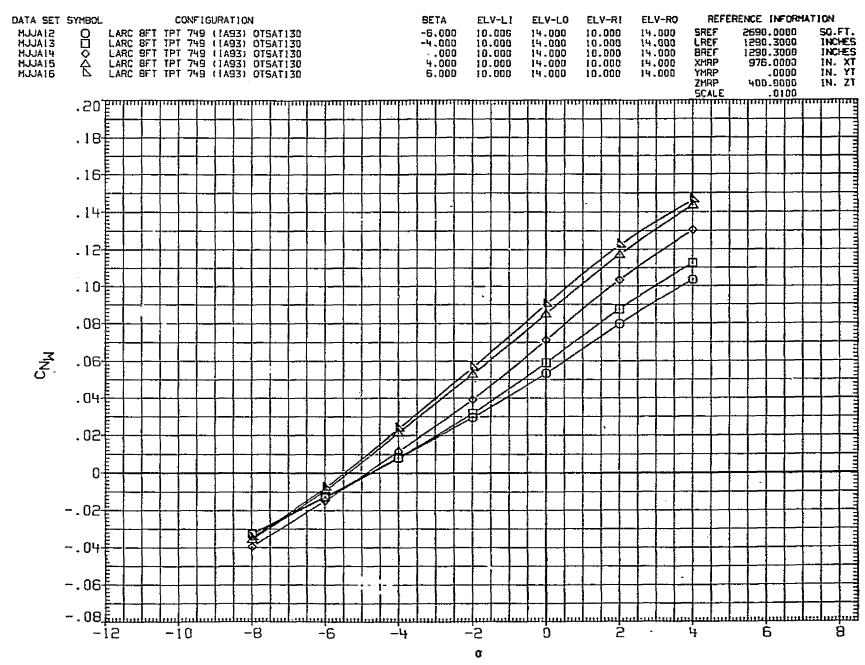


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

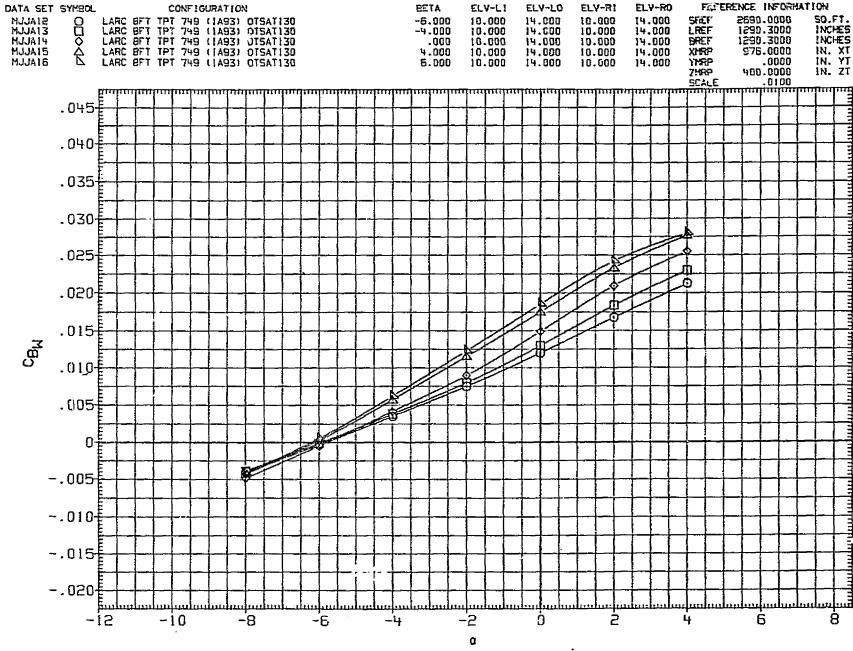


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

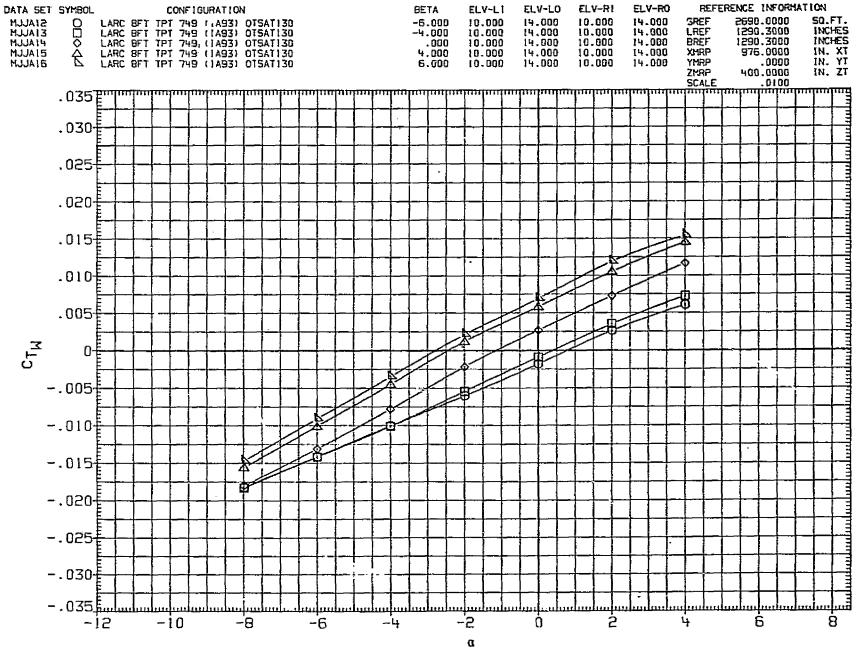
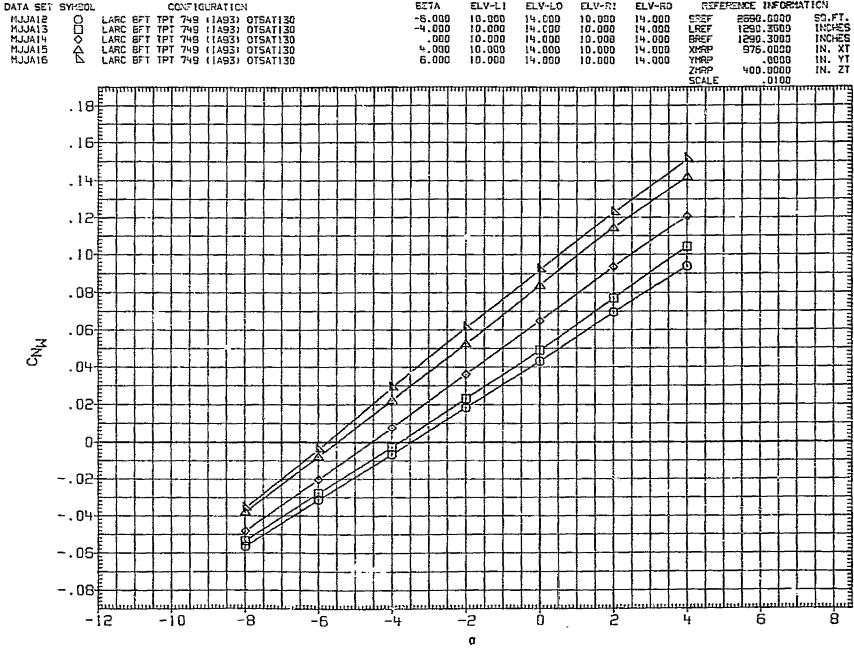


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



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ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS FIG. 6

REFERENCE INFORMATION

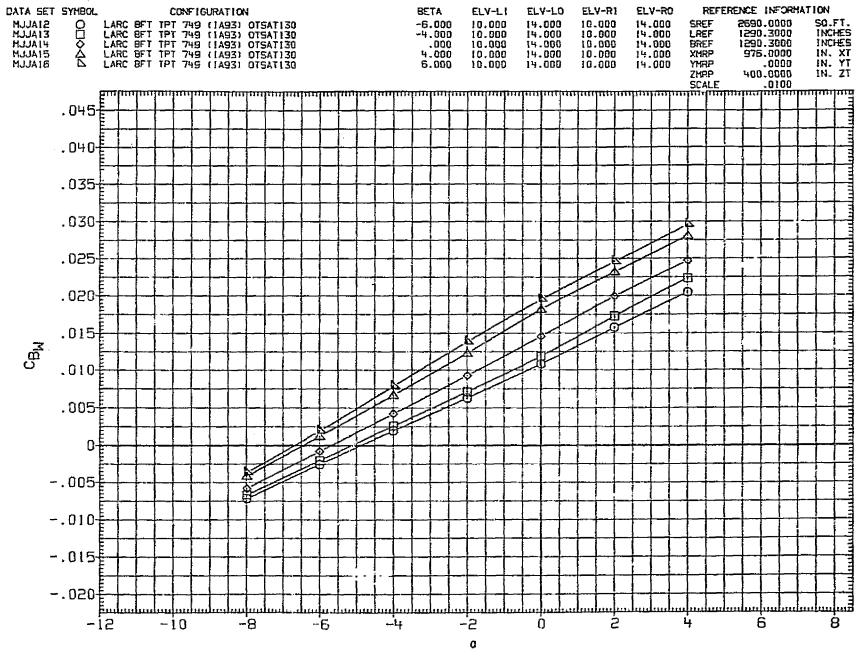
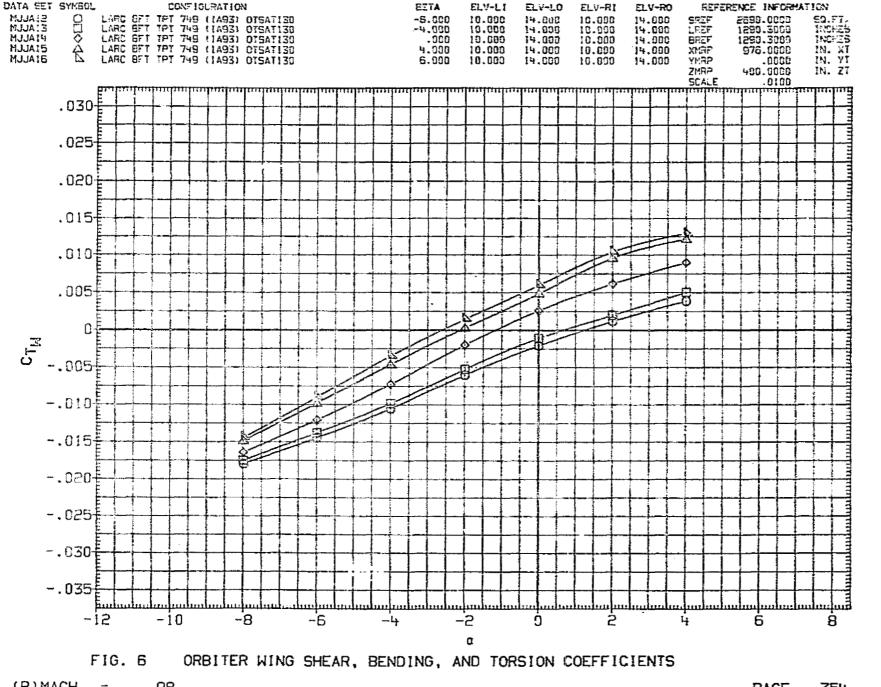


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS FIG. 6

(B)MACH = .98

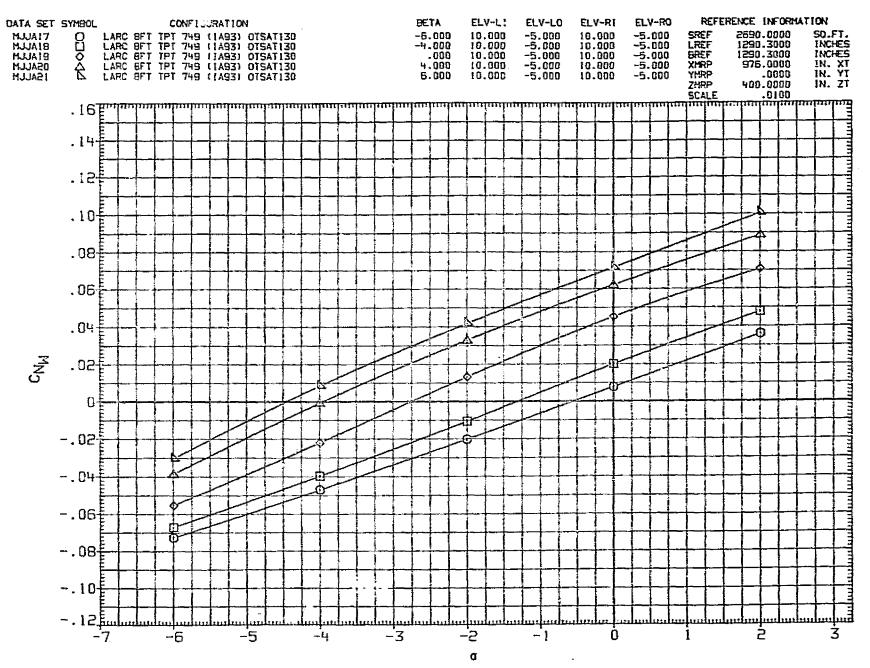


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

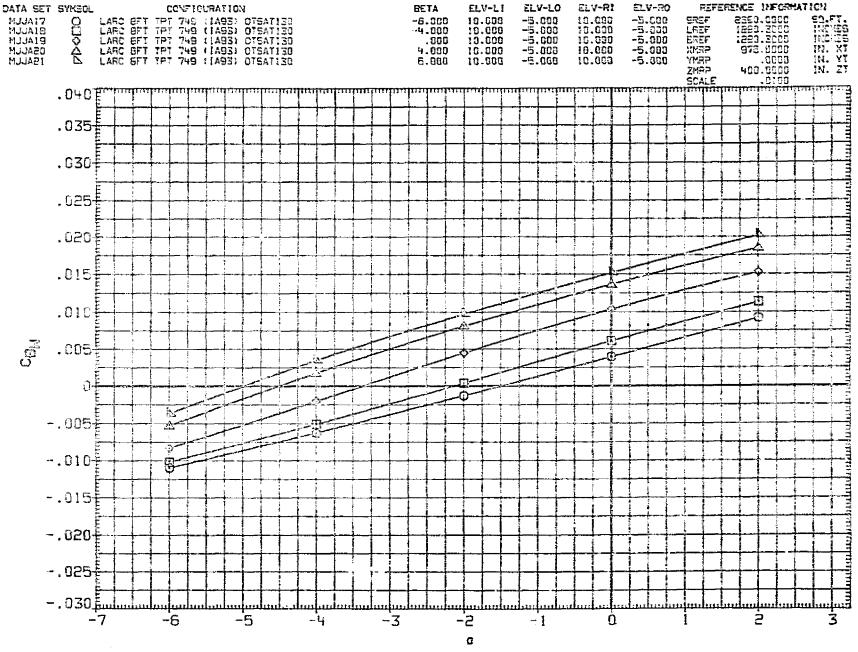


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A)MACH = 1.15 PAGE 356

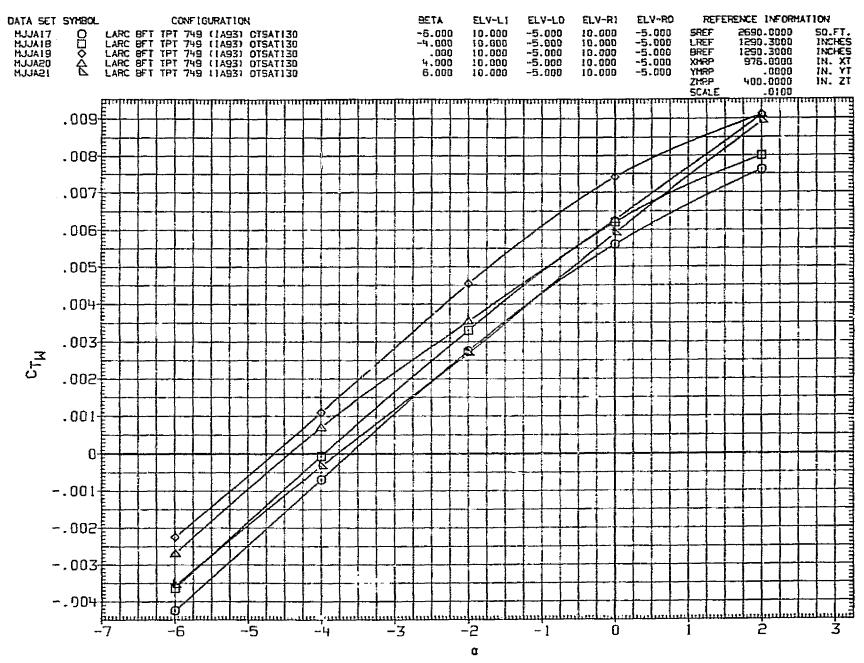


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

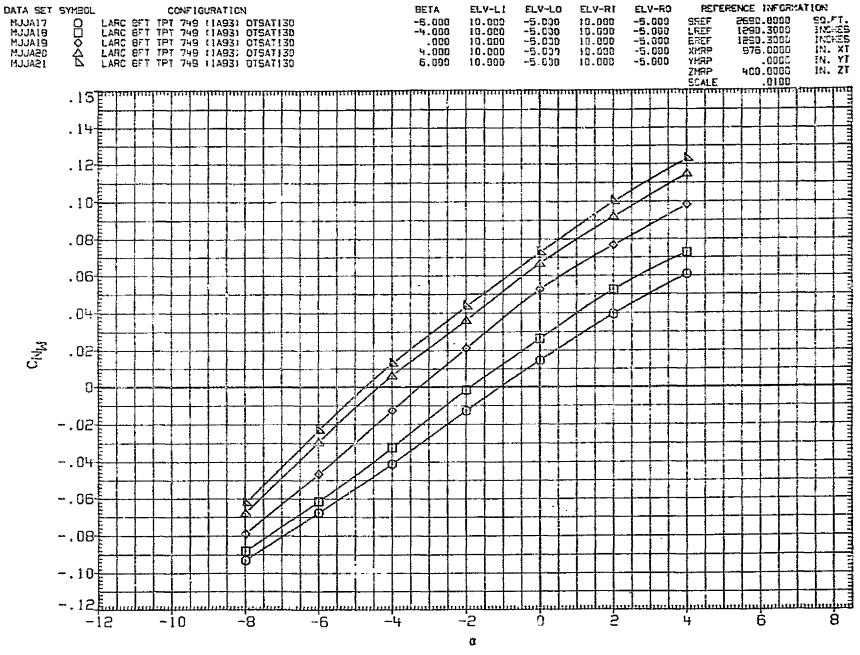


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

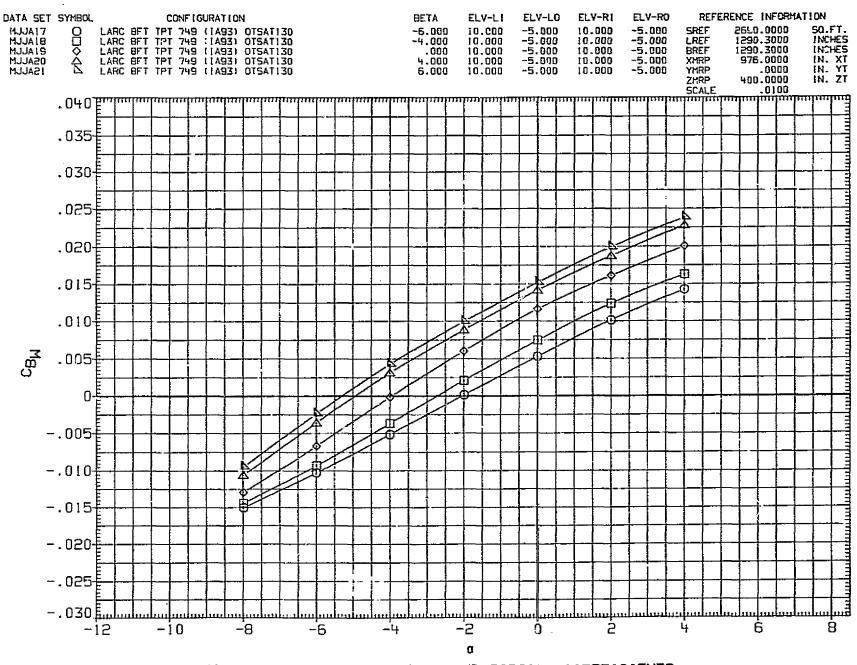


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

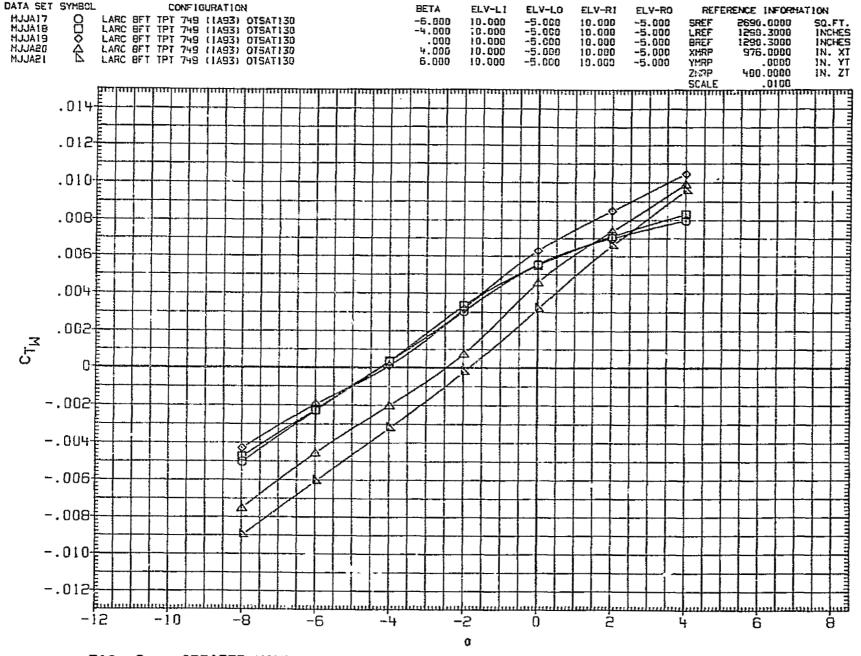


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(B) MACH = 1.20 PAGE

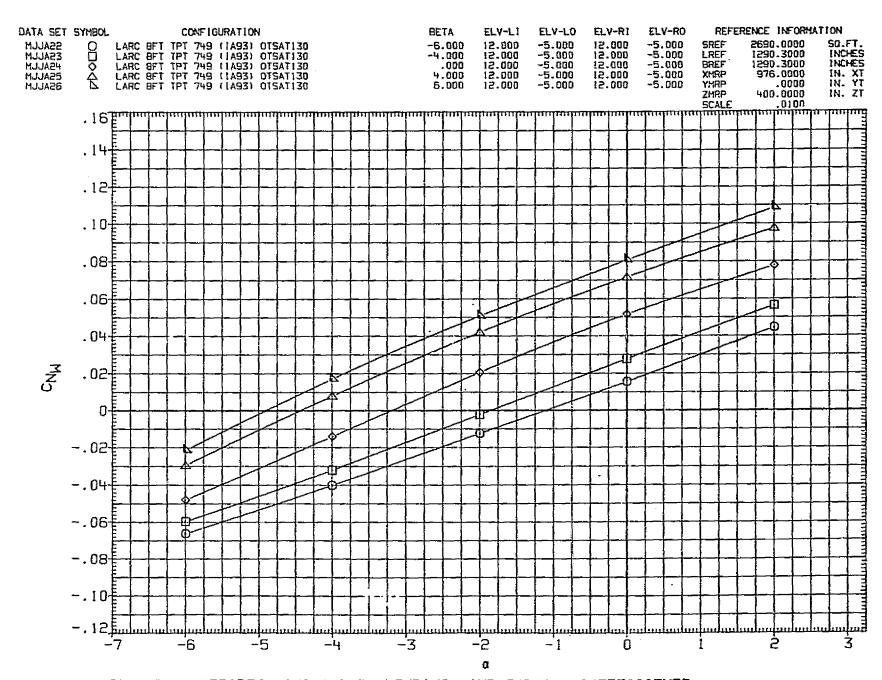


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

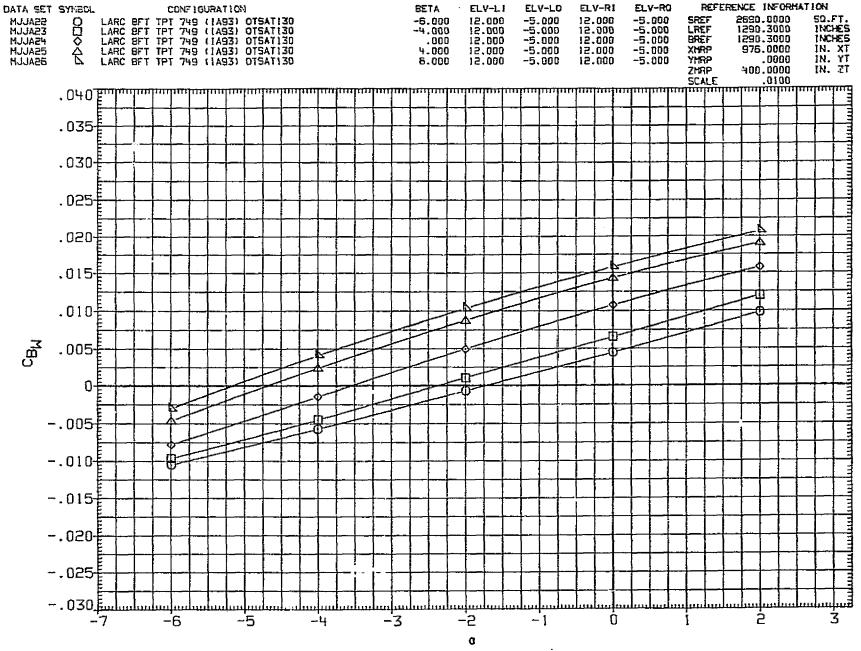


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



ORBITER WING SHEAR. BENDING, AND TORSION COEFFICIENTS FIG. 6

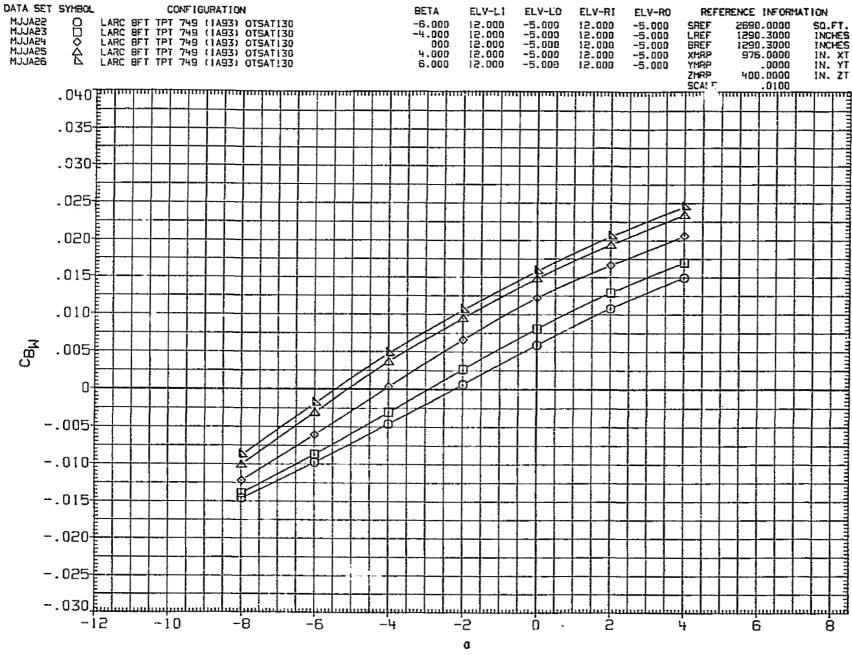


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

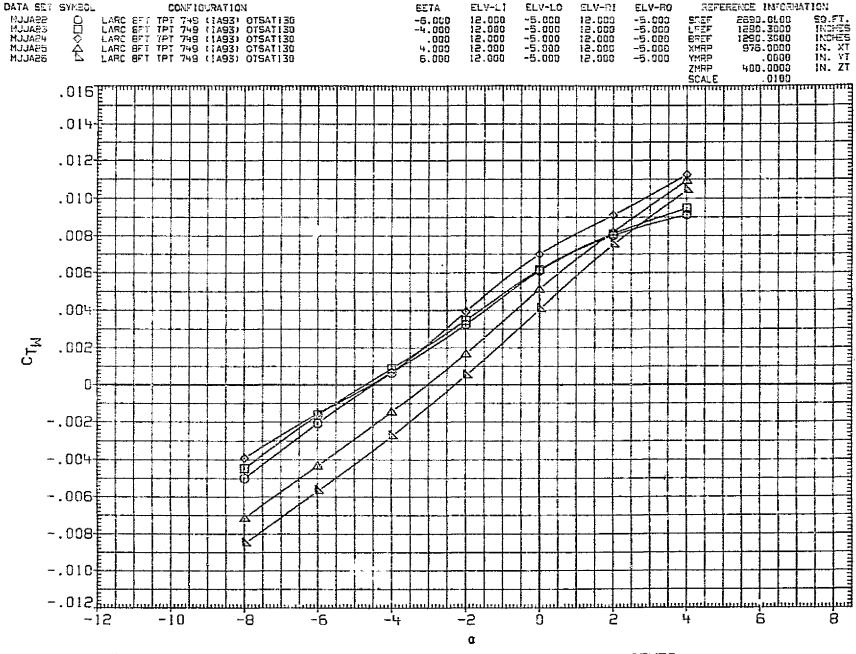


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

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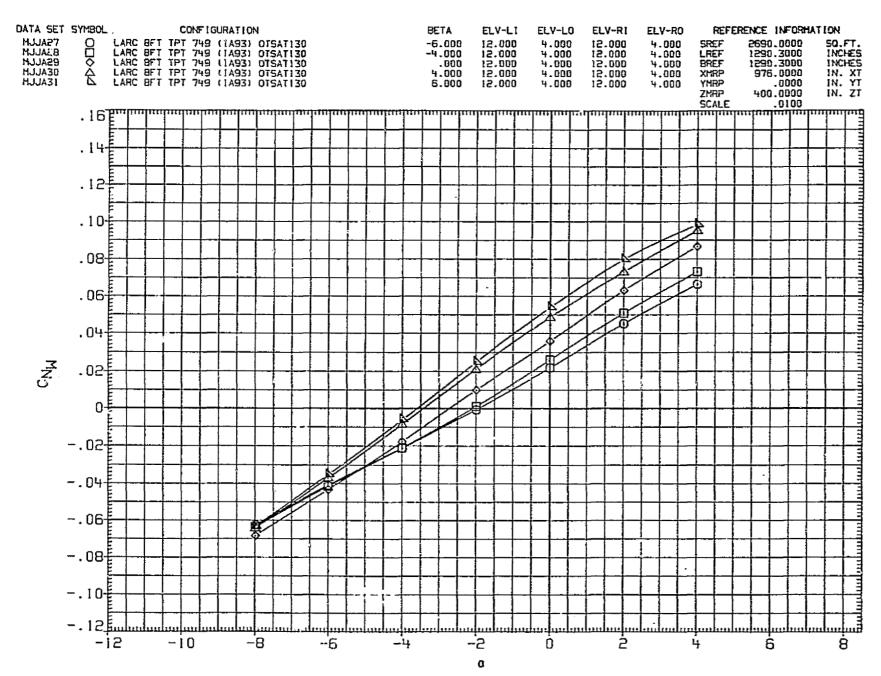


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

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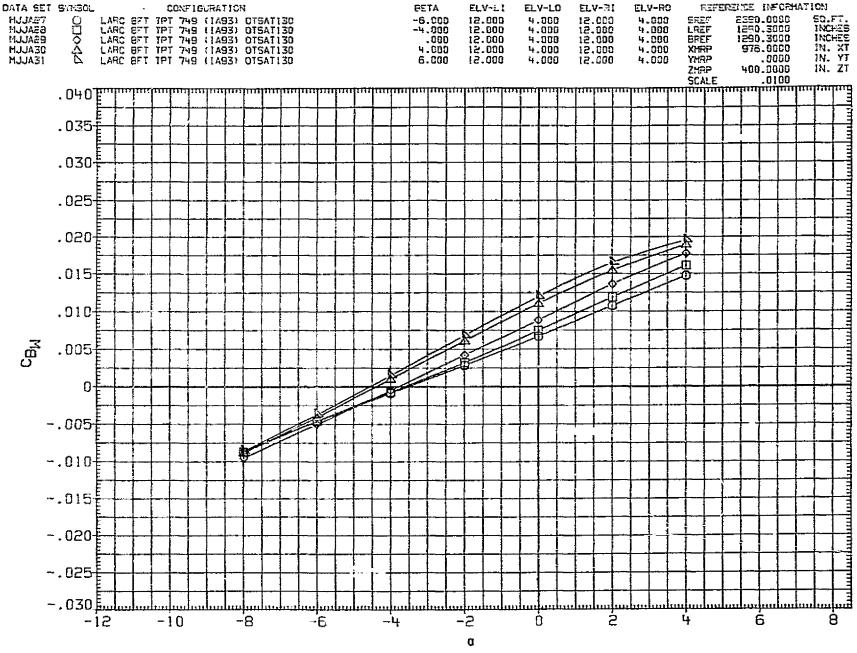


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

.90

(A)MACH

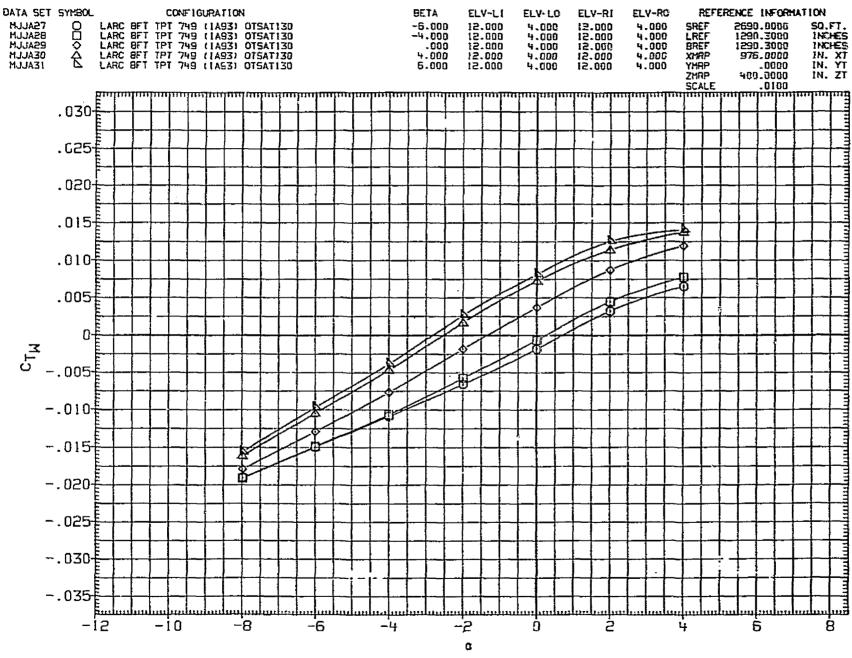


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A) MACH = .90

PAGE

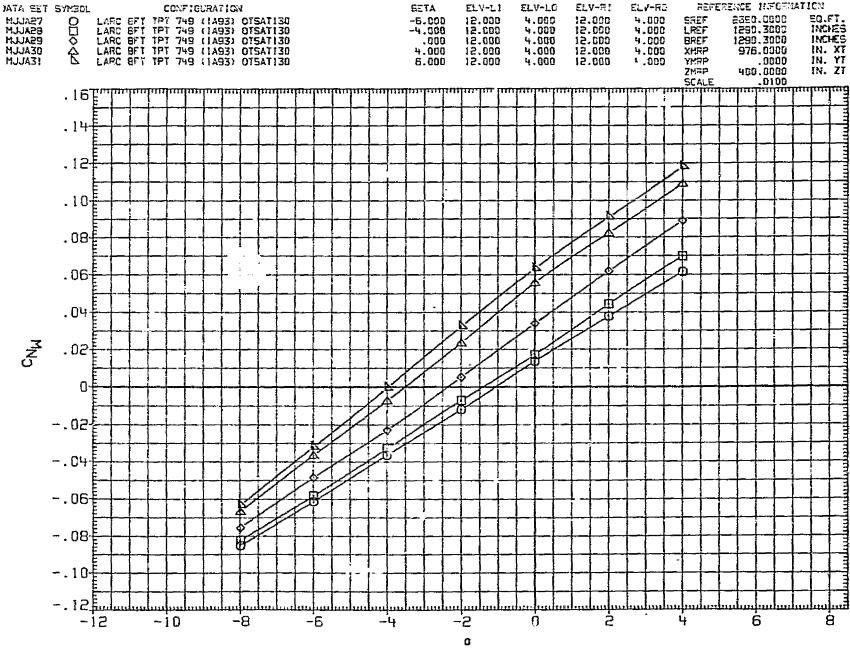


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(B)MACH = .98



FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

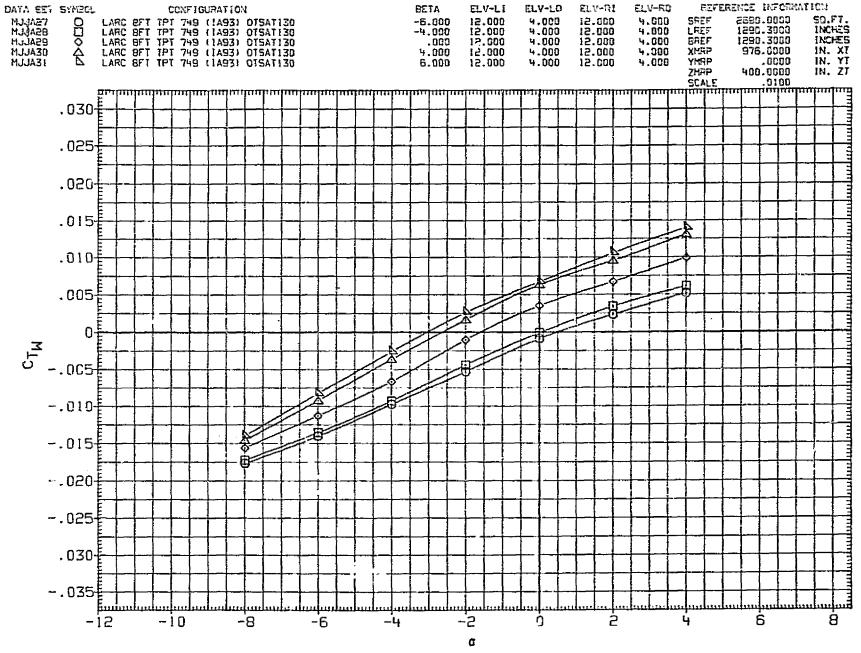


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(B) MACH = .98 PAGE 372

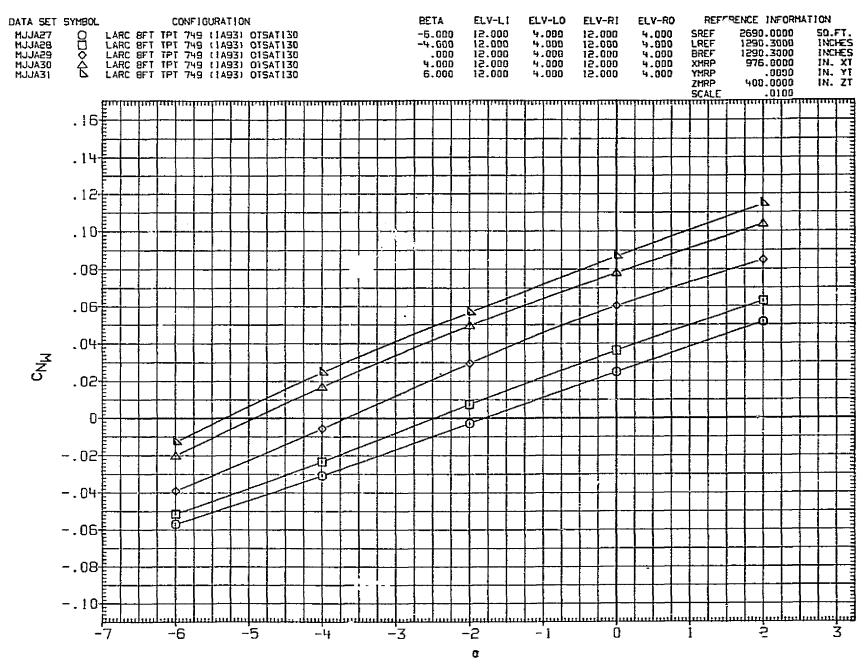


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

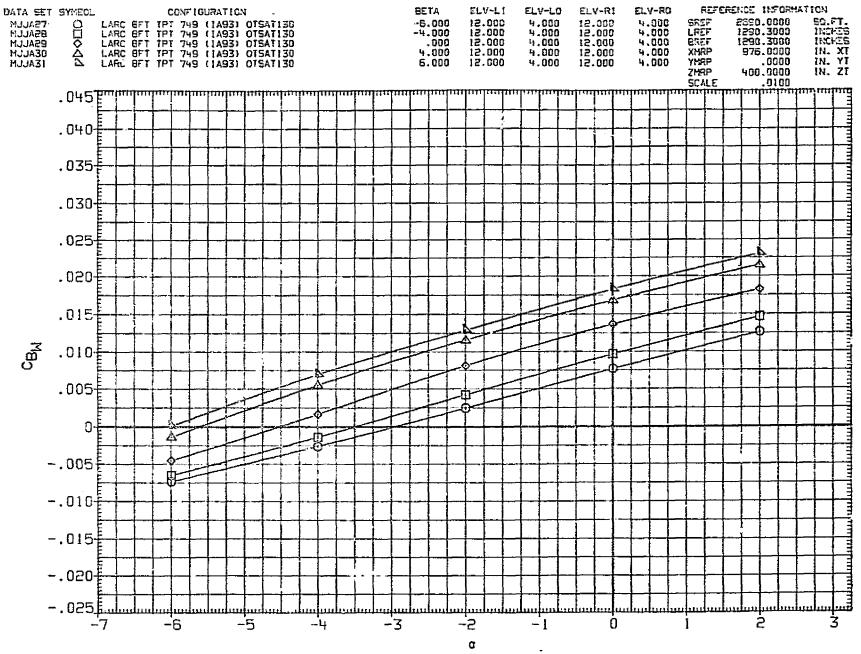


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

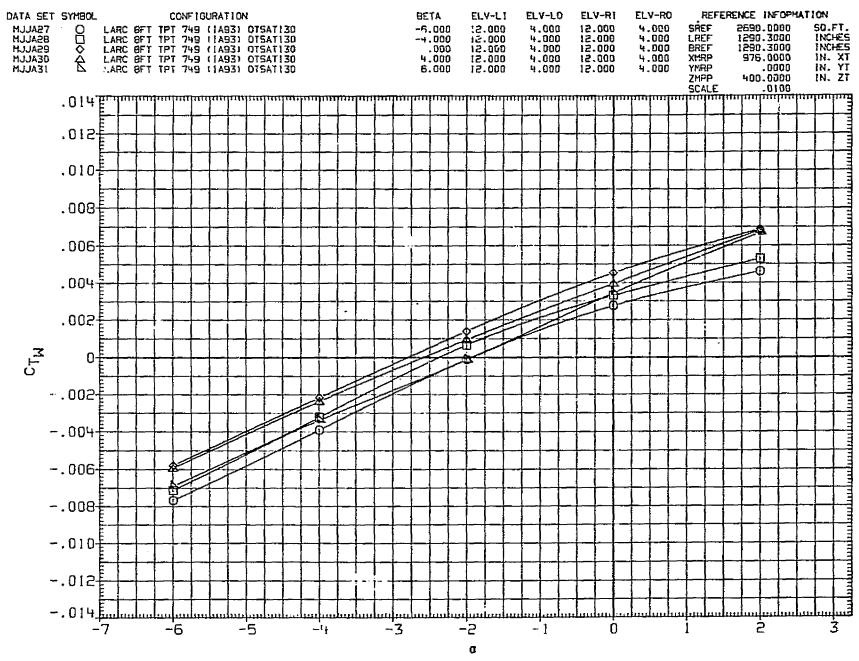
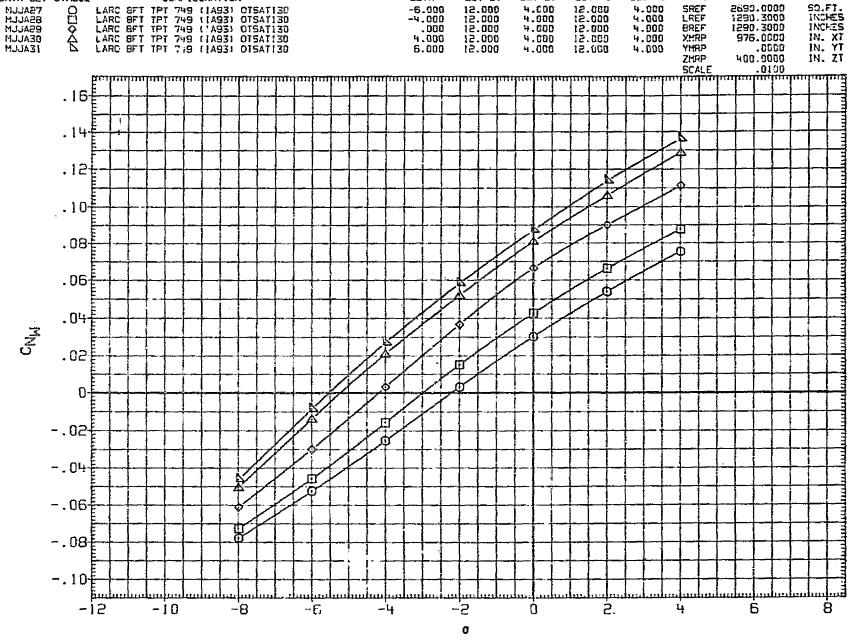


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



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DATA SET SYMBOL

CONFIGURATION

ELV-L1

ELV-LO ELV-RI

ELV-RO

REFERENCE INFORMATION

376

FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(D)MACH = 1.20 PAGE

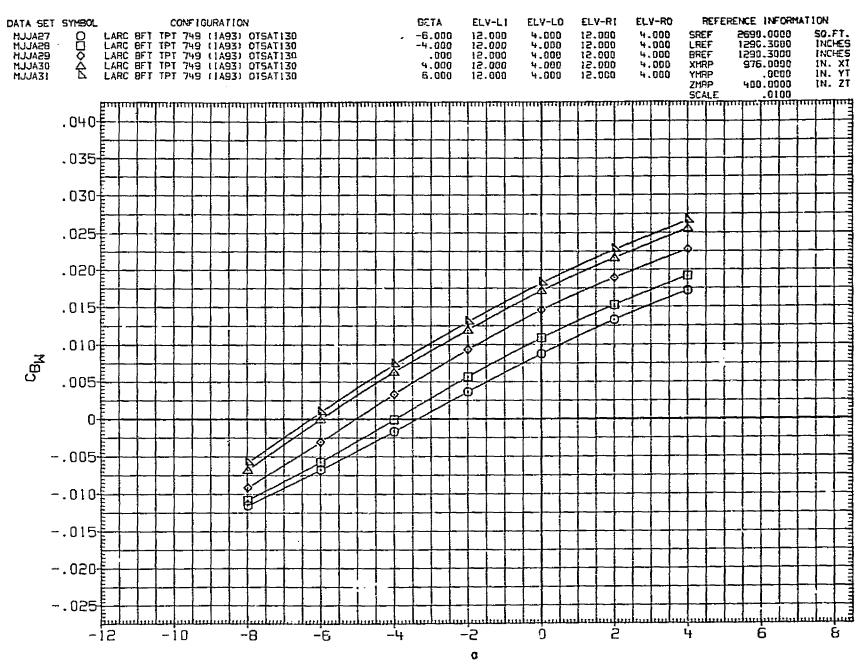


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

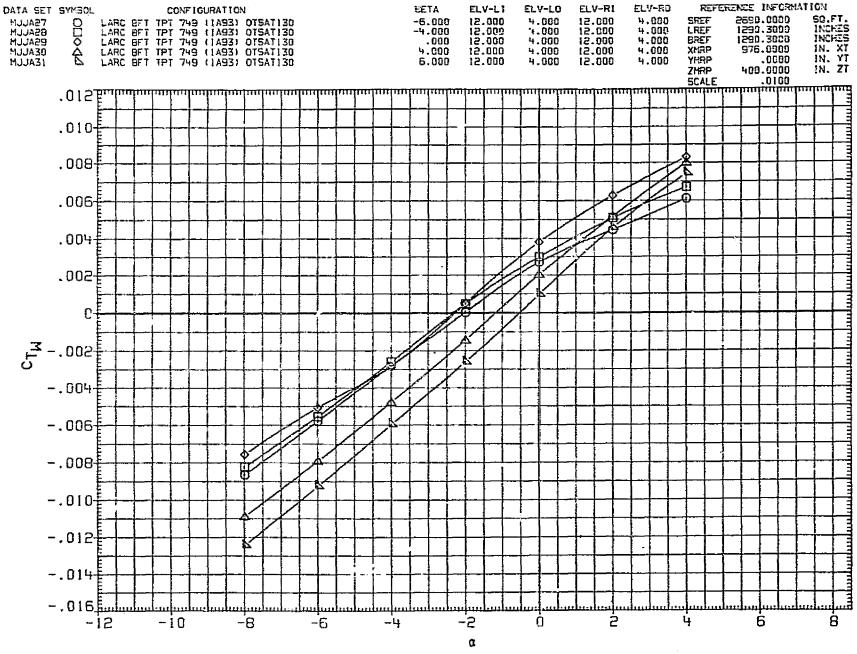


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

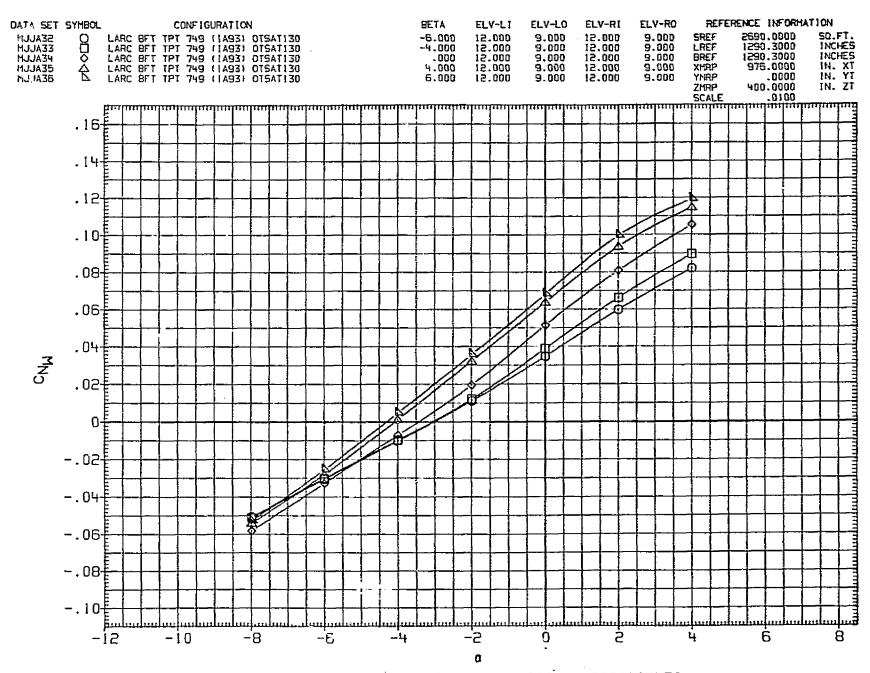
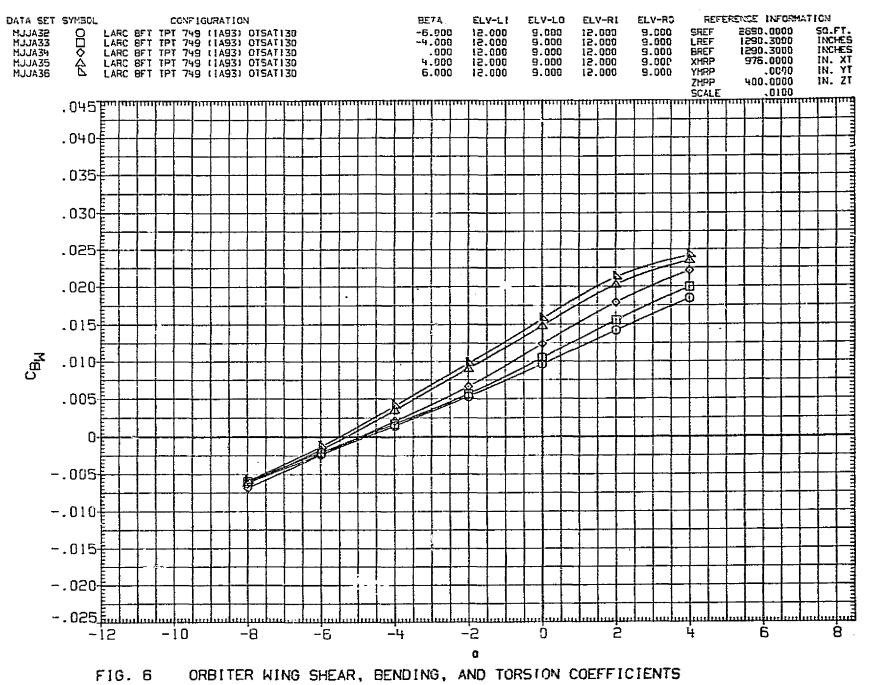


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



(A) MACH = .90 PAGE 380

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

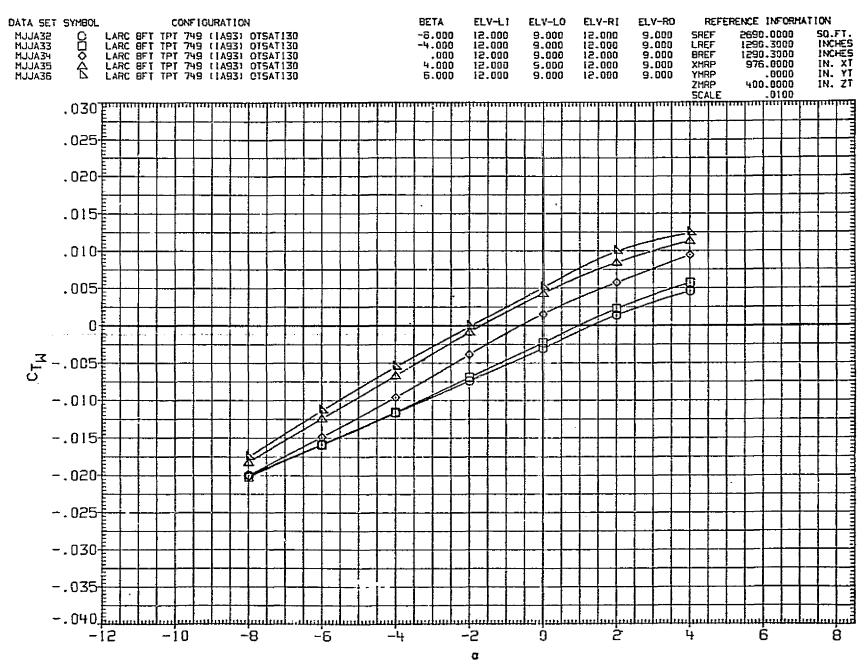


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(B) MACH = .98 PAGE 382

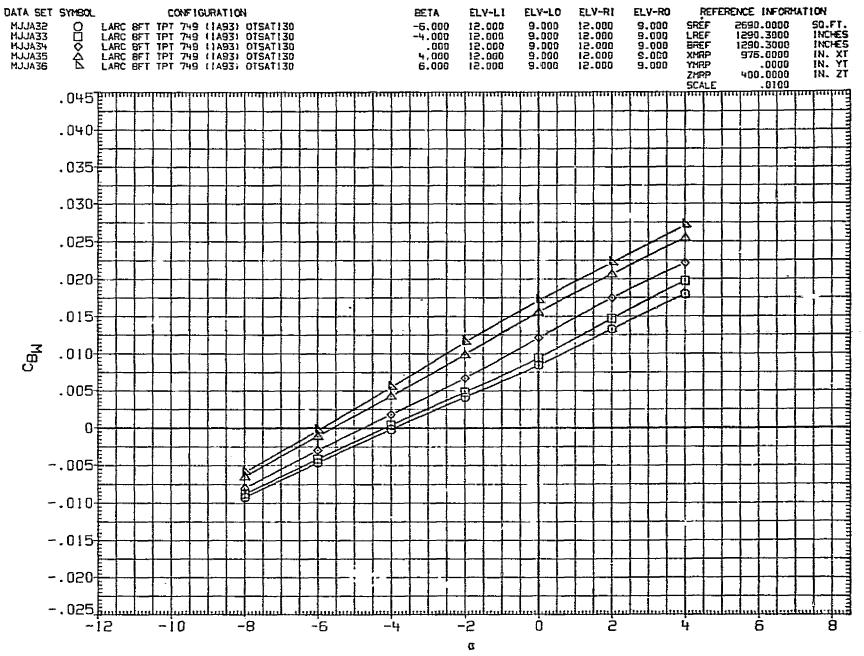


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

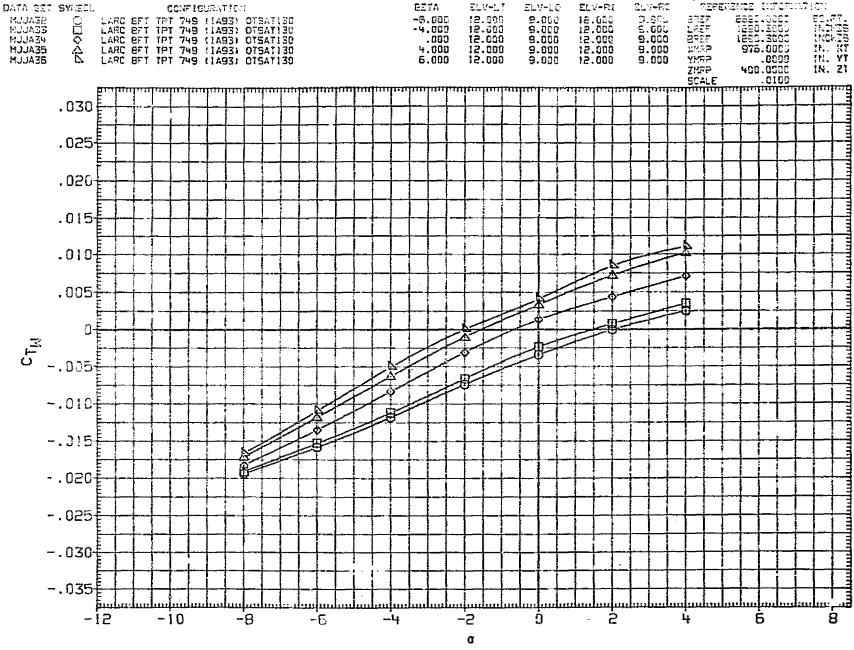


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

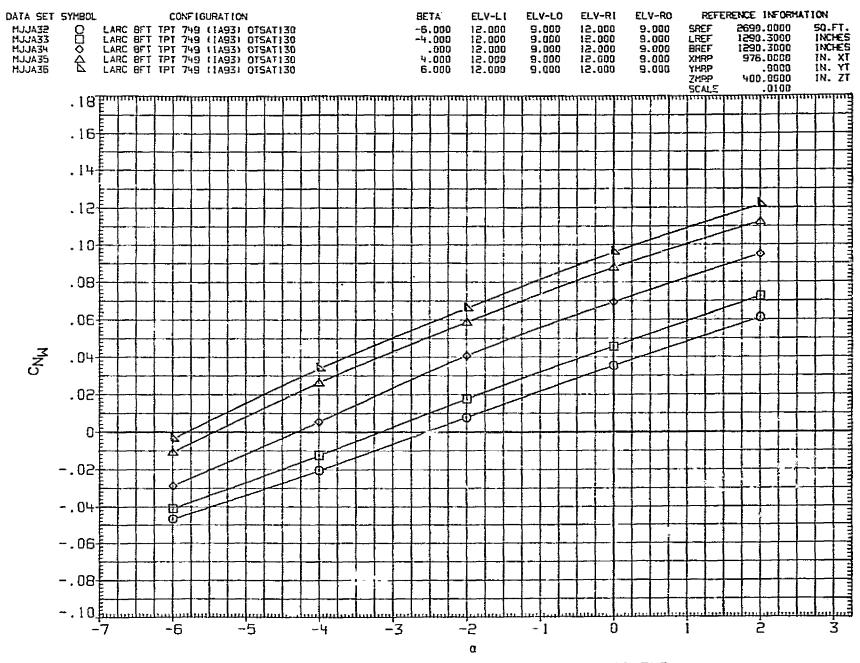


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

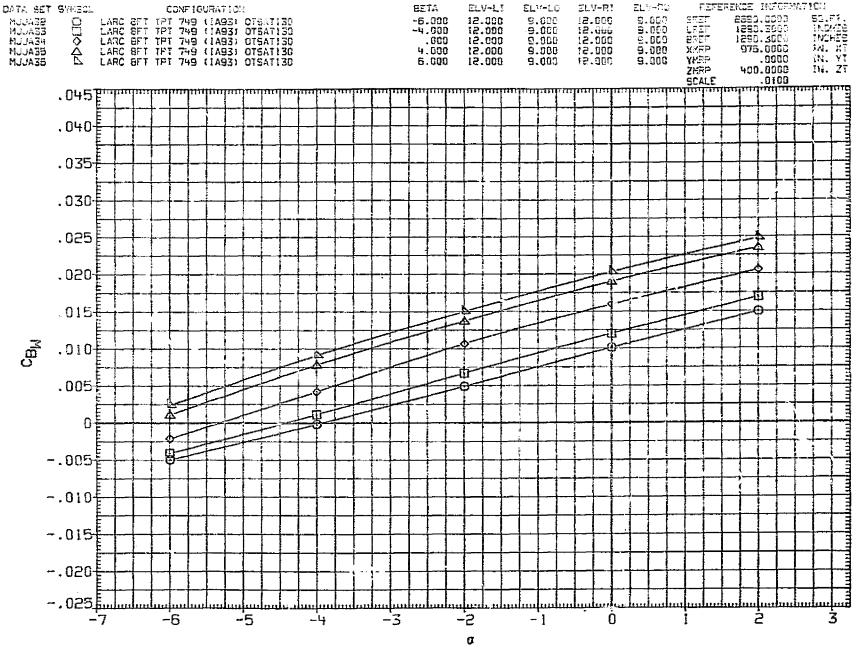


FIG. 6 ORBITER WING SHEAR, BENDING. AND TORSION COEFFICIENTS

(C)MACH * 1.15 PAGE 386

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

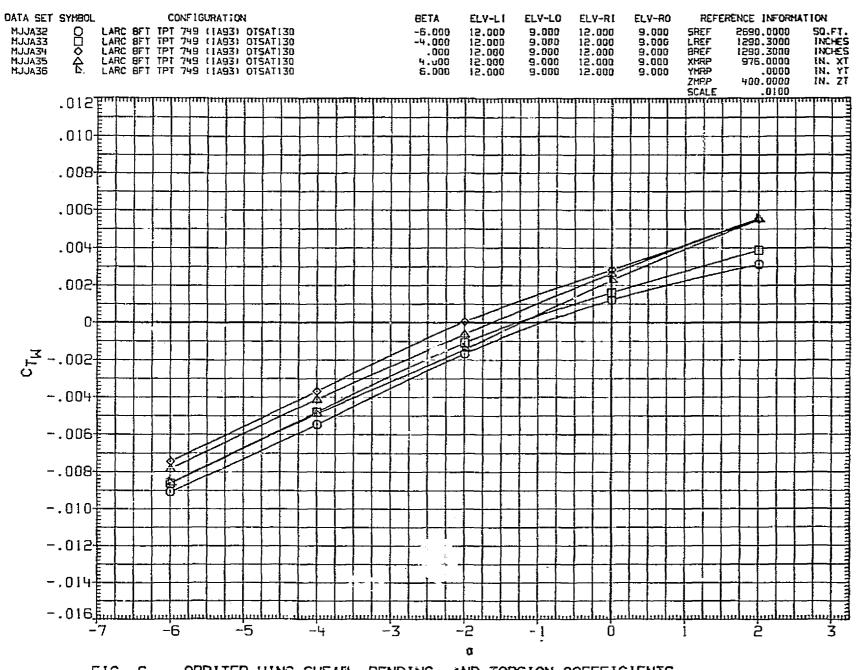


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(C)MACH = 1.15 PAGE 387

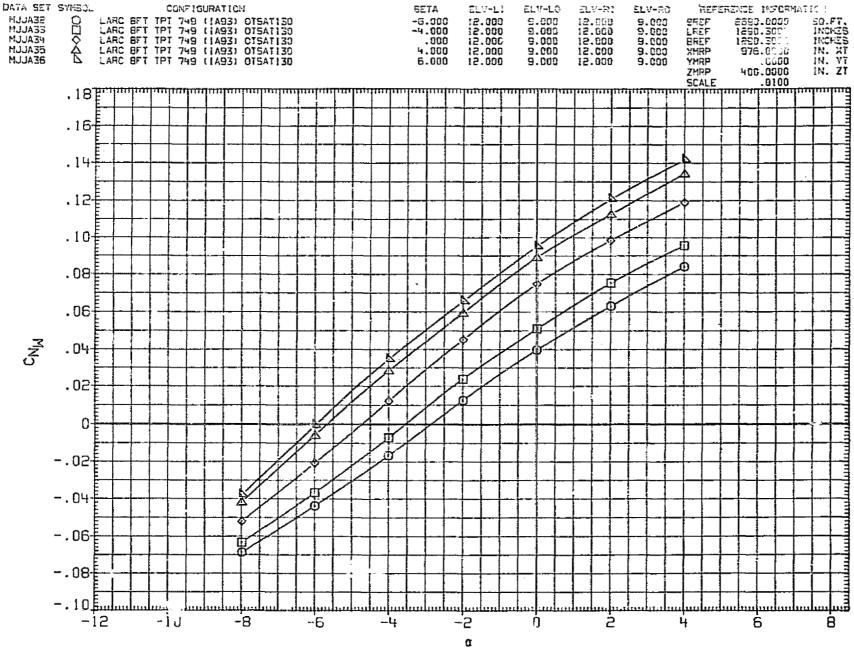


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

388

(D)MACH = 1.20

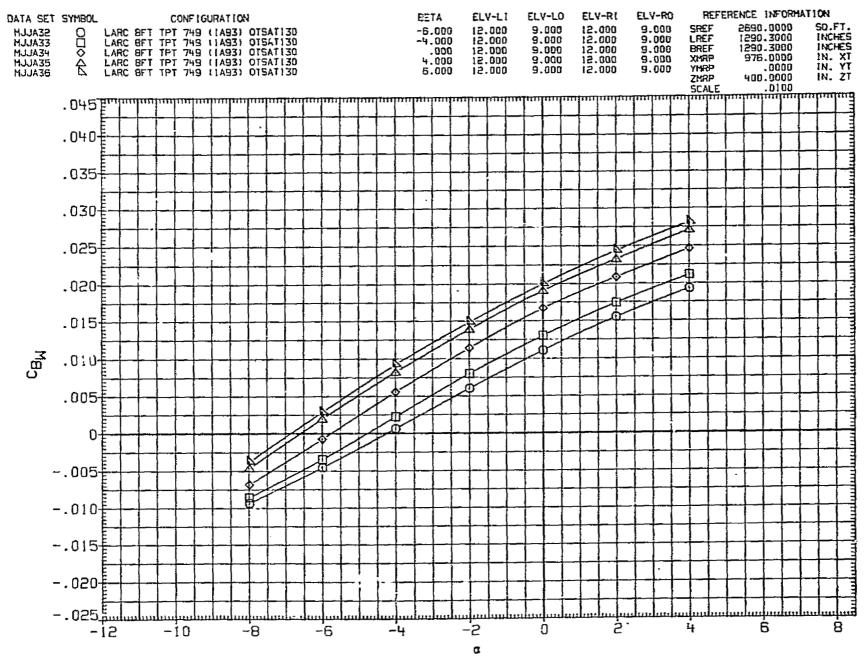


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

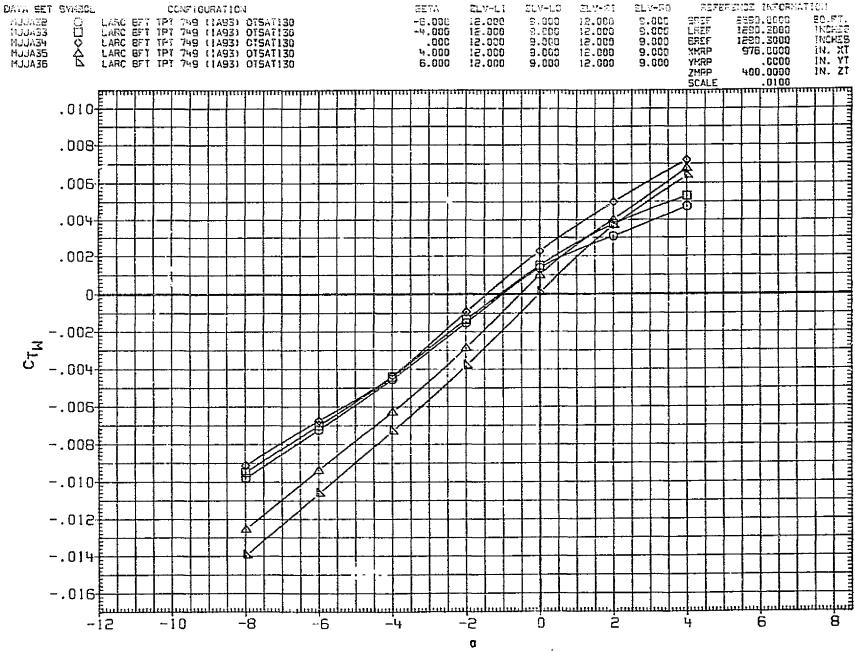


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

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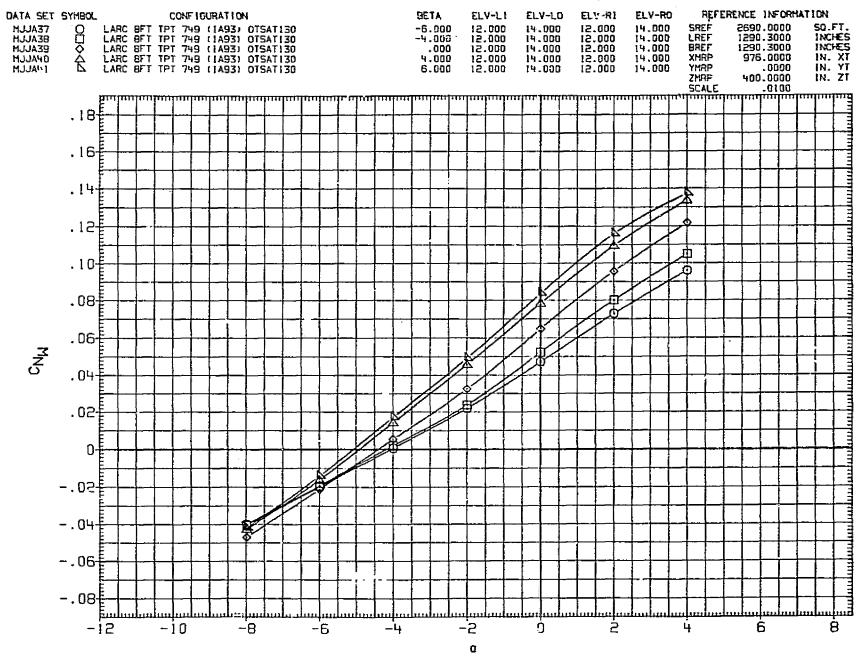


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

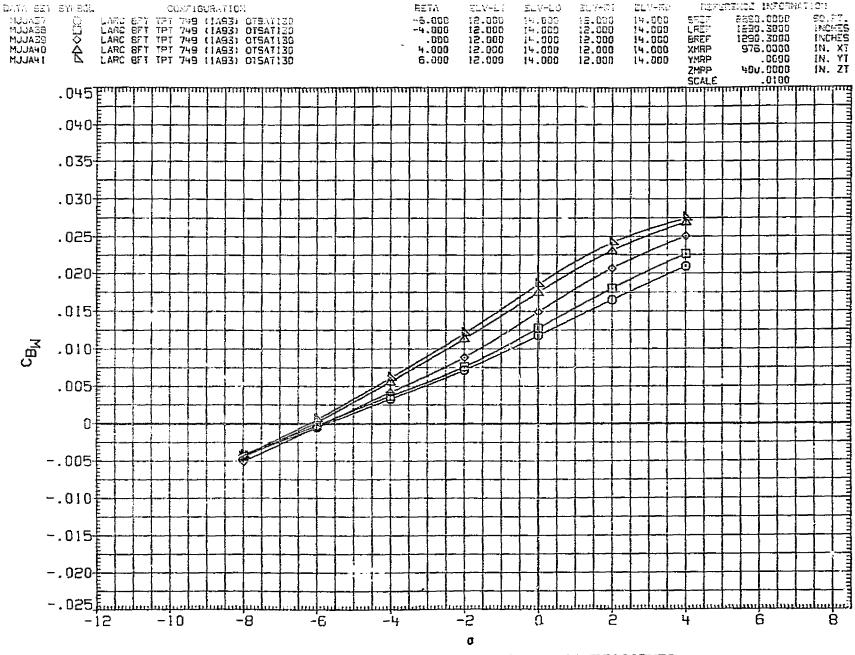


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A)MACH = .90

PAGE

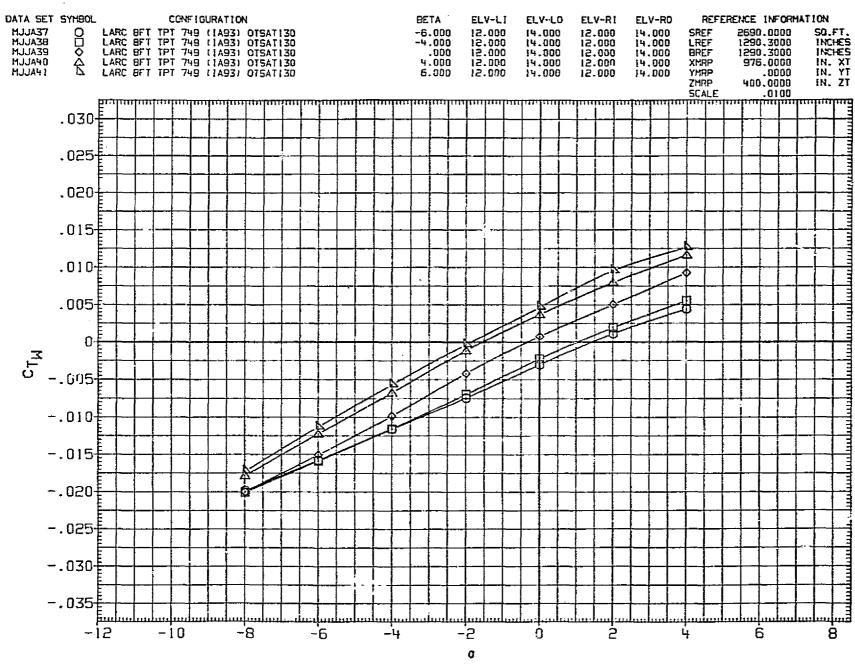
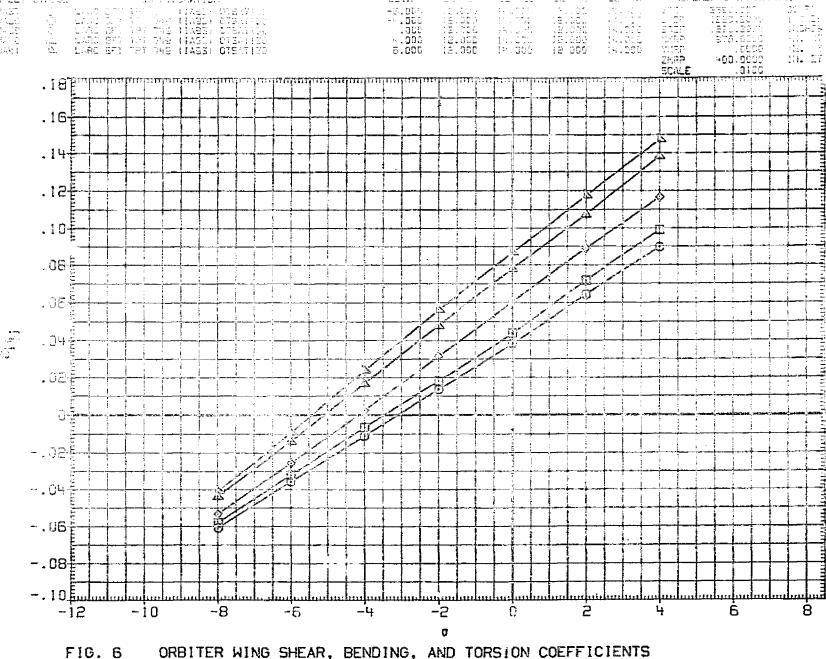


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A) MACH = .90



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394 PAGE (B)MACH = .98

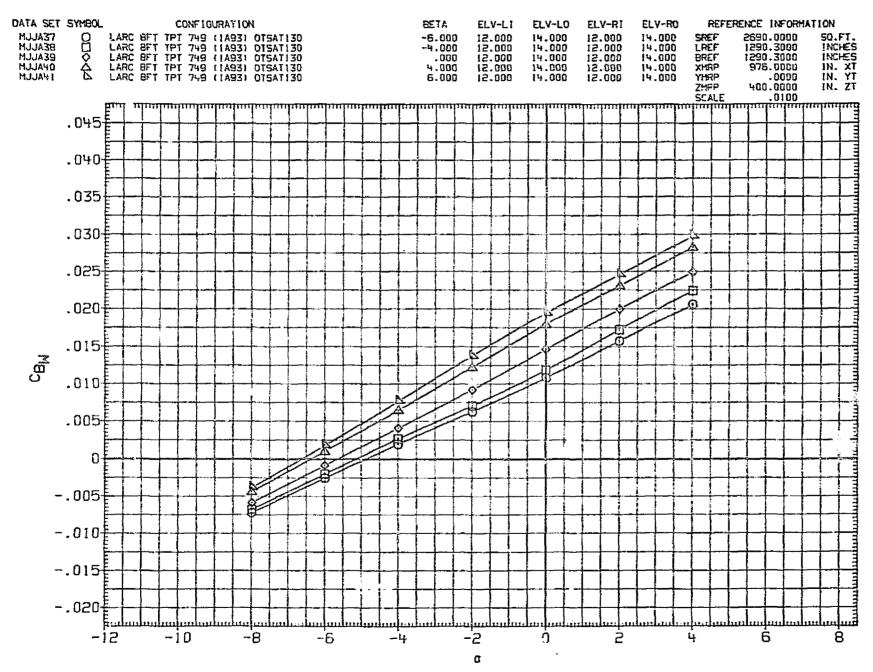


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

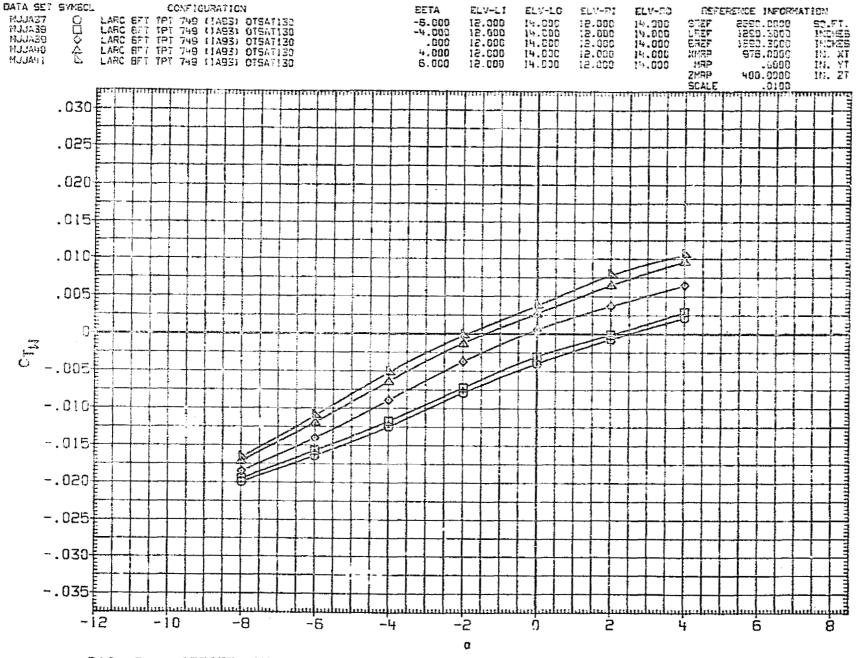
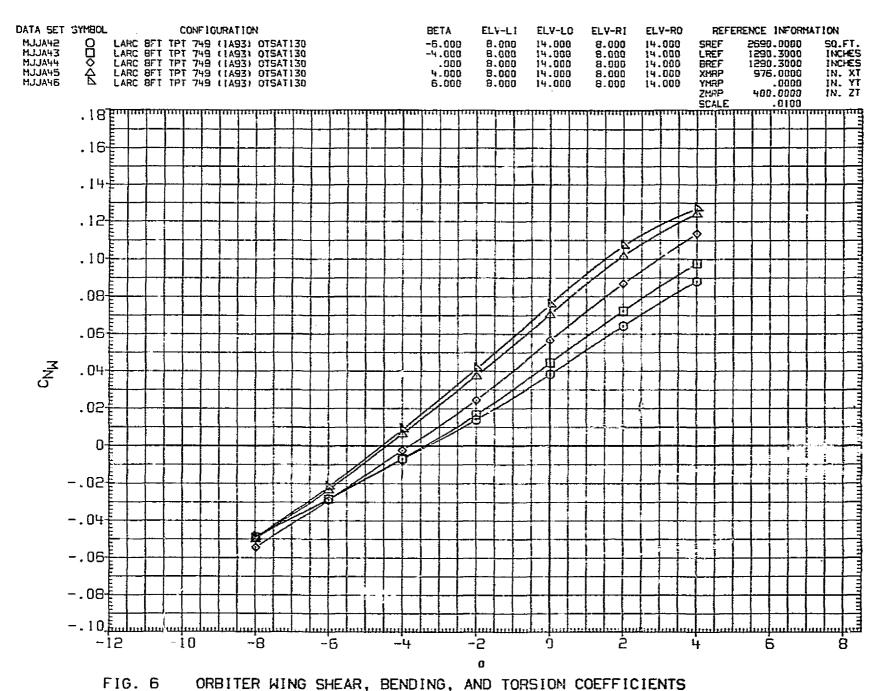


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(B) MACH = .98

PAGE



1 10. D ONBITER WING SHEAR, BENDING, AND TURSION COEFFICIENT

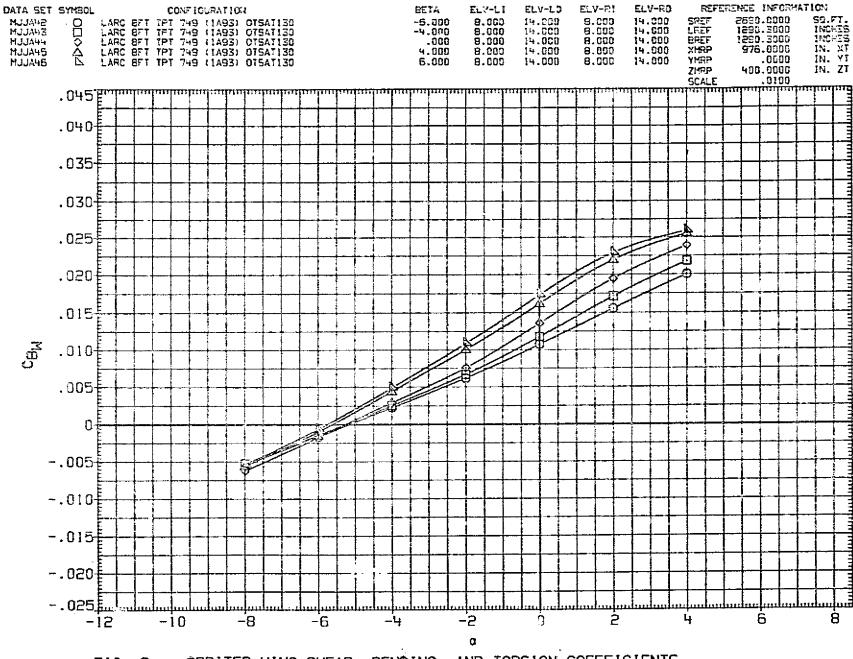


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A) MACH = .90PAGE 398

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

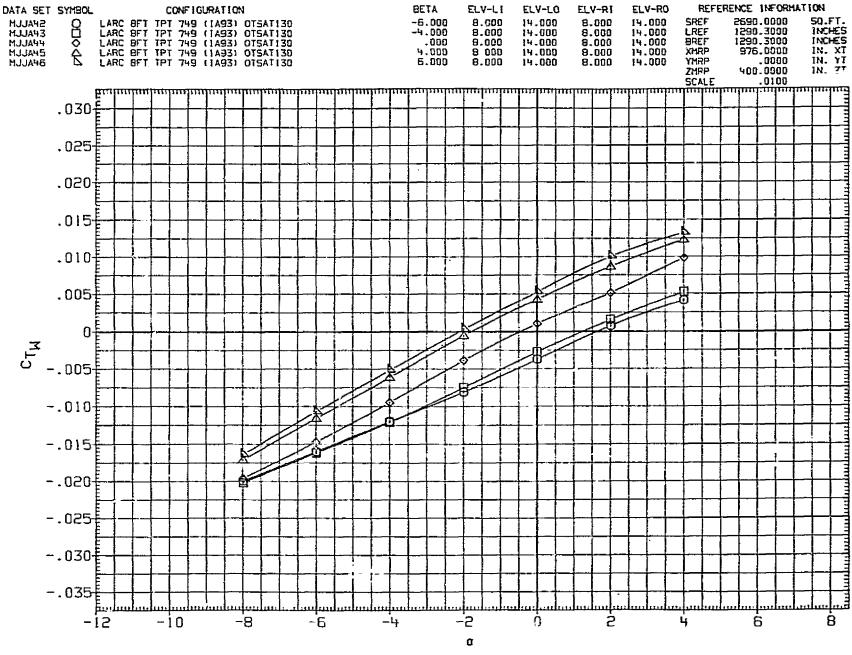
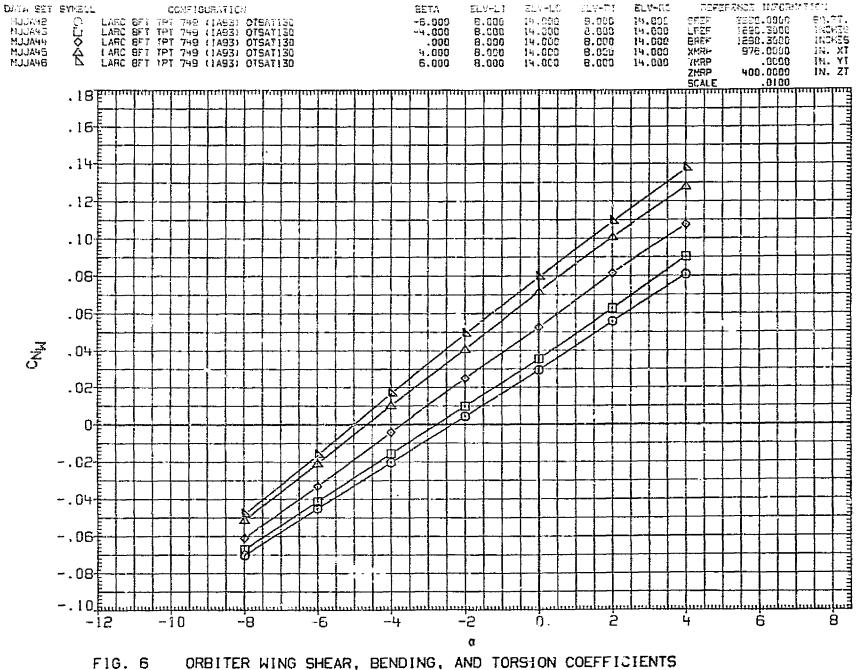


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



(8) MACH = .98 PAGE 400

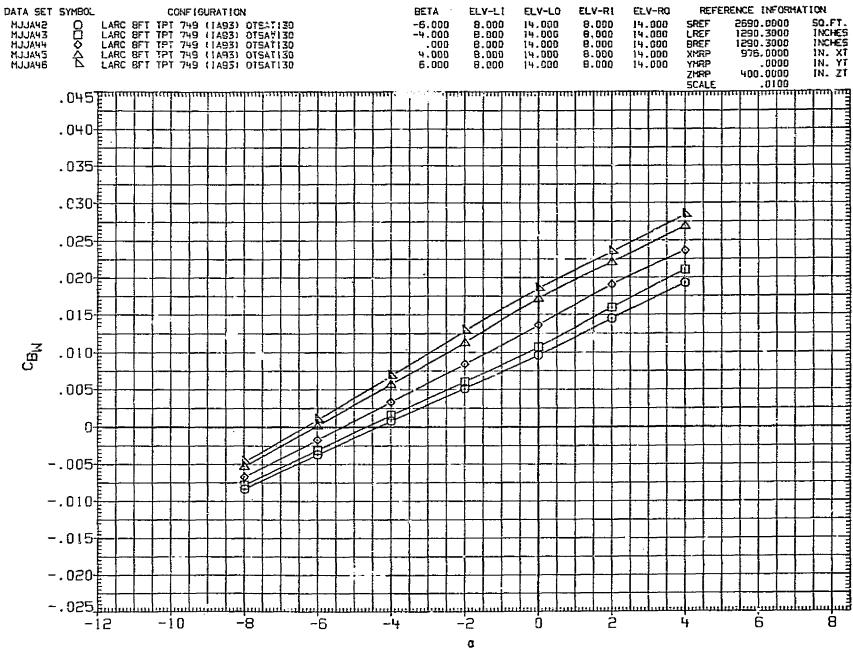


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

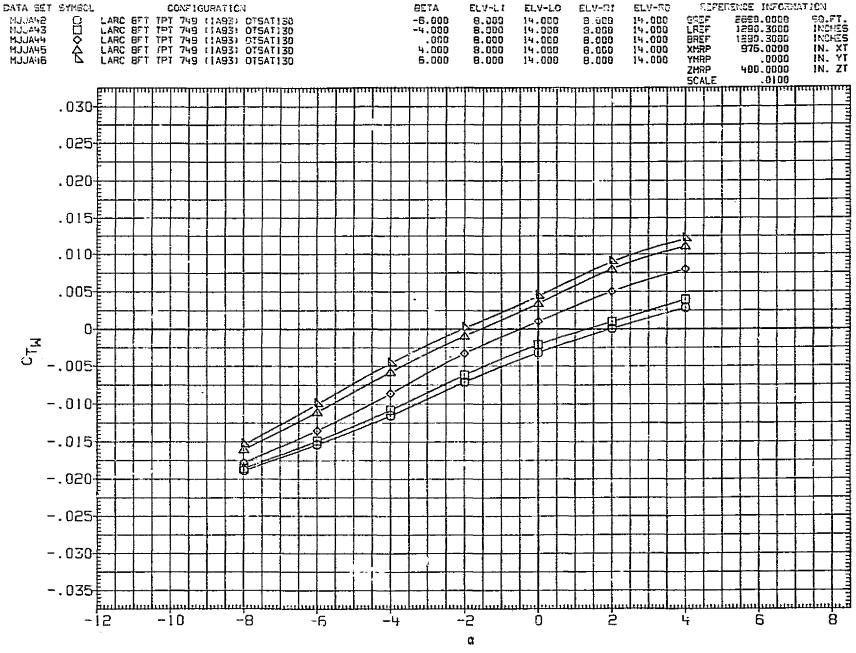


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

PAGE + 402

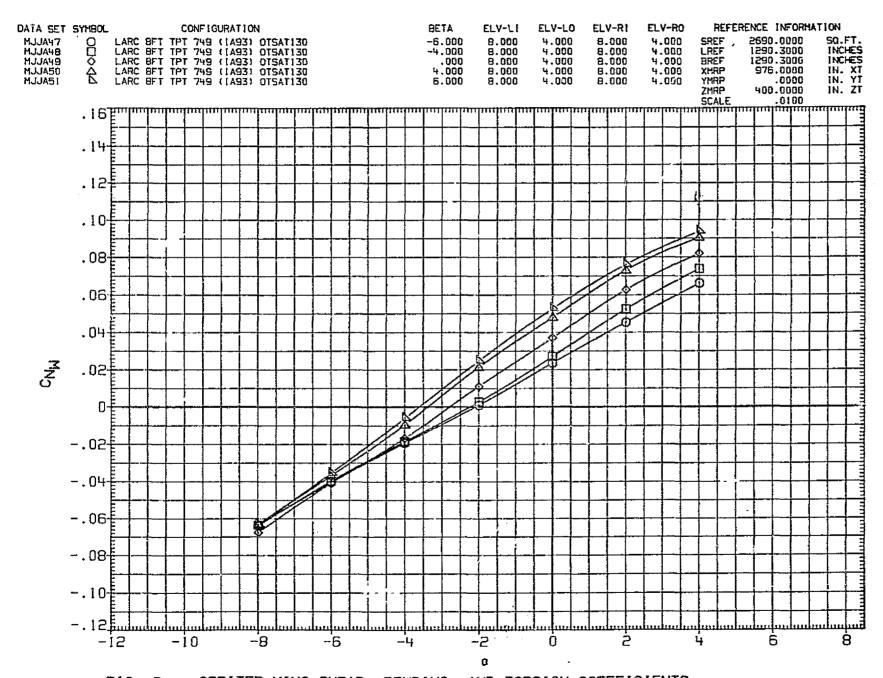


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

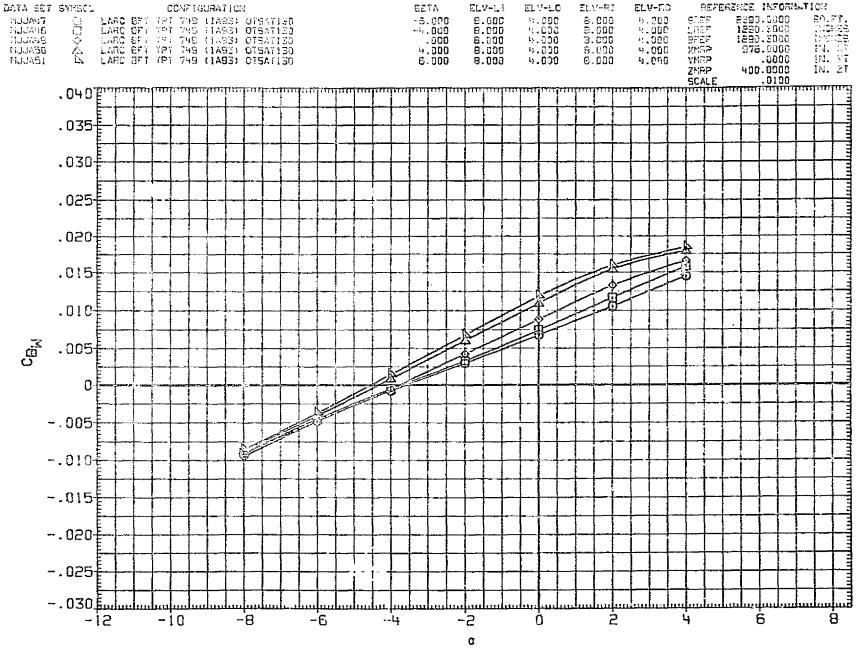


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

404

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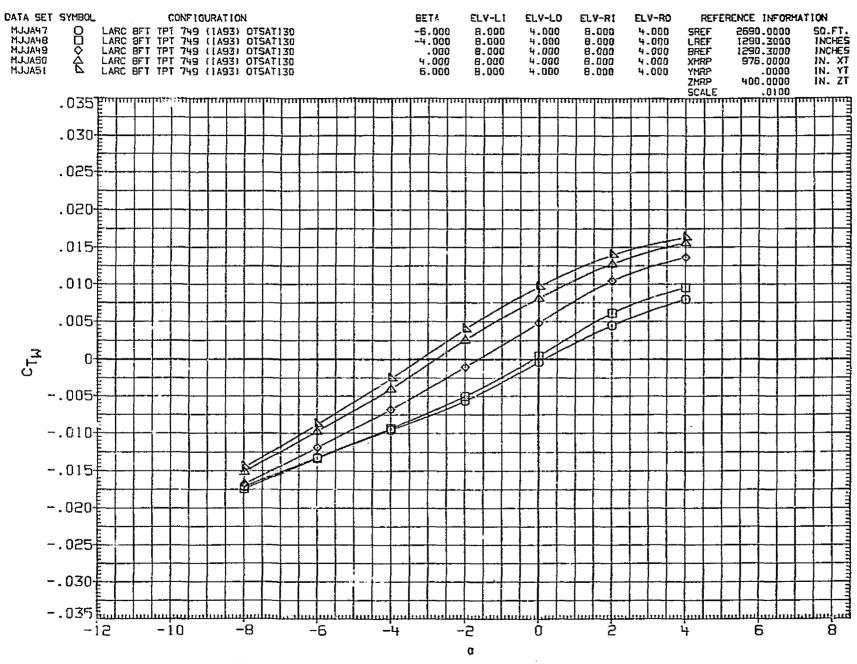


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(8) MACH = .98 PAGE 406

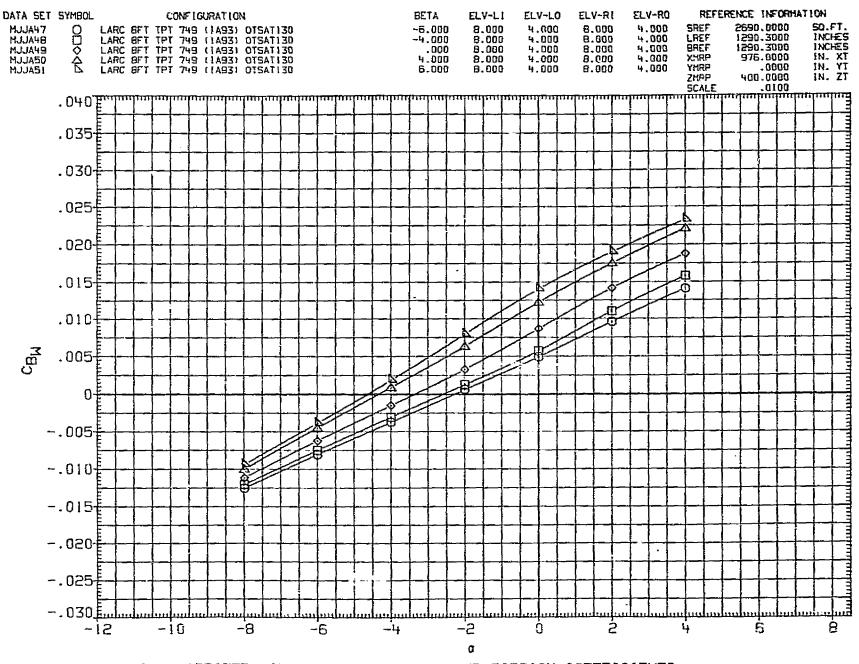


FIG. 6 ORBITER WING SHEAR, BEMDING, AND TORSION COEFFICIENTS

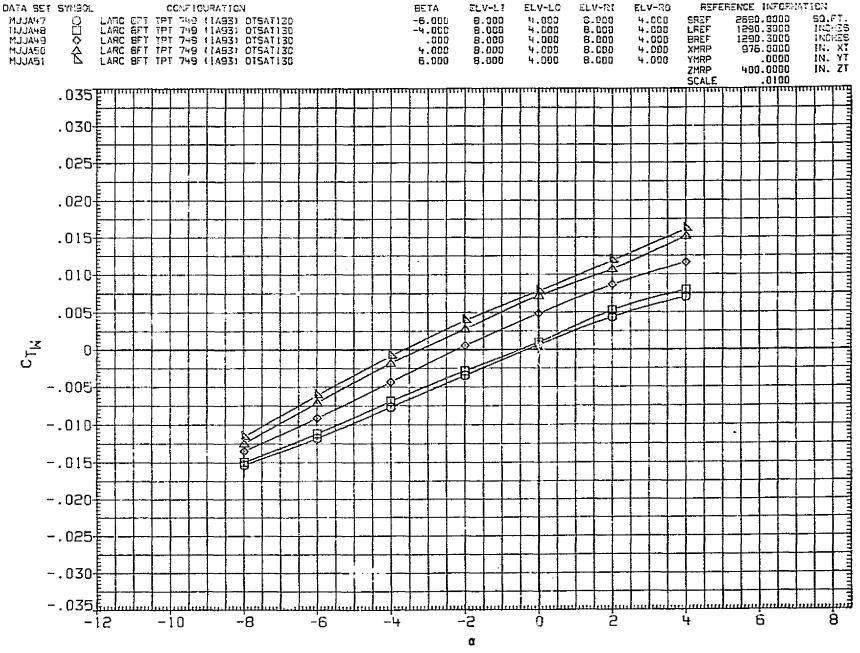


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

408

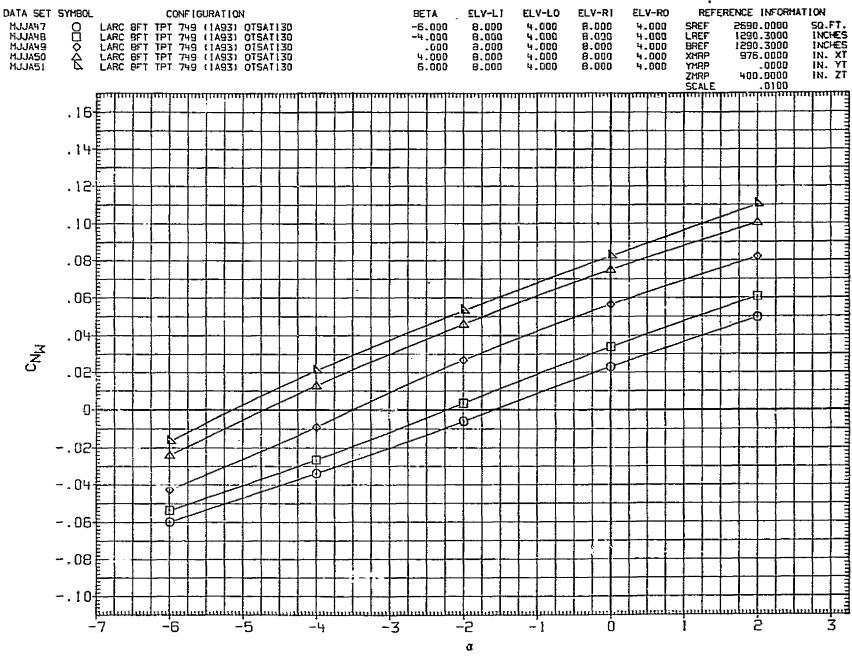


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

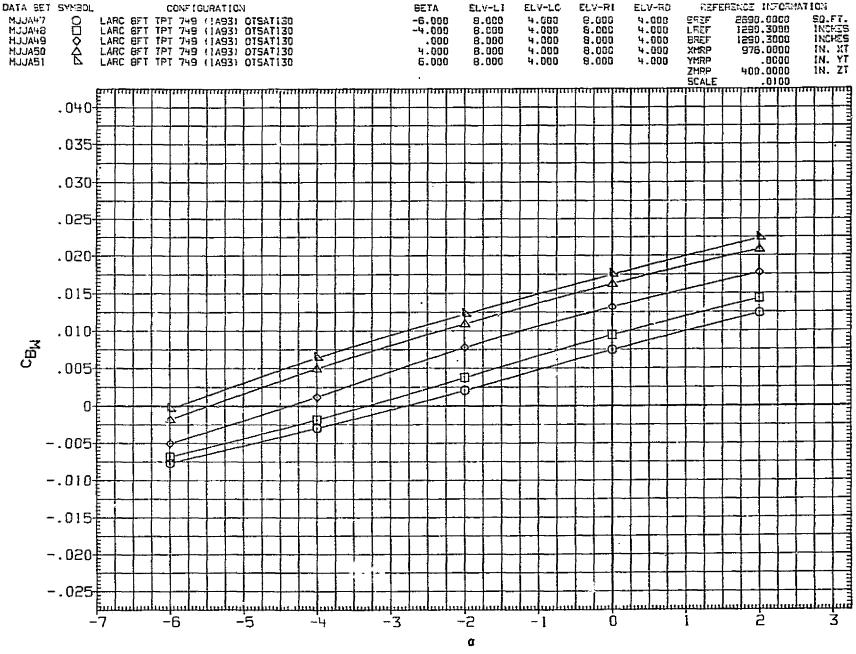


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(C)MACH = 1.15 PAGE 410

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

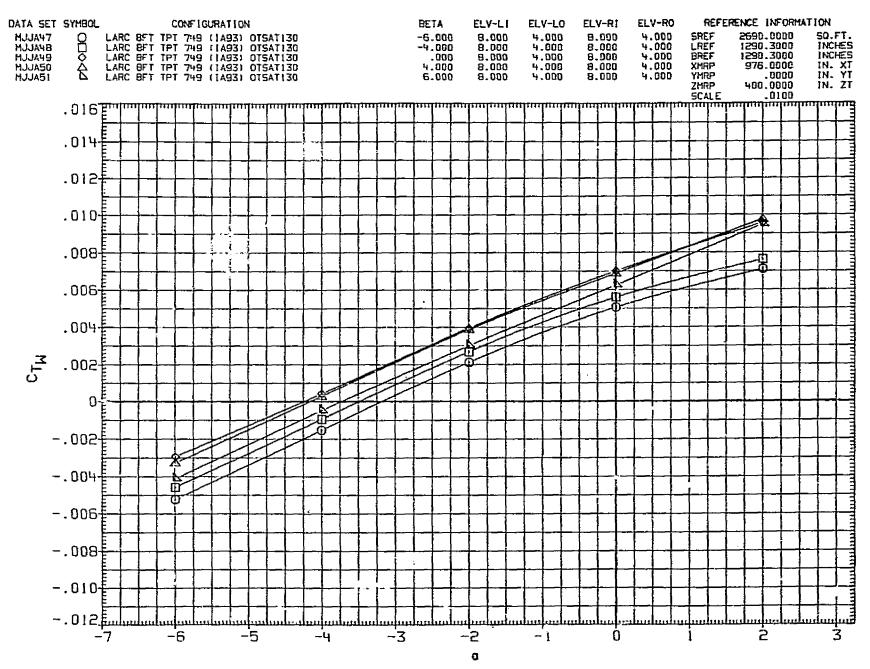
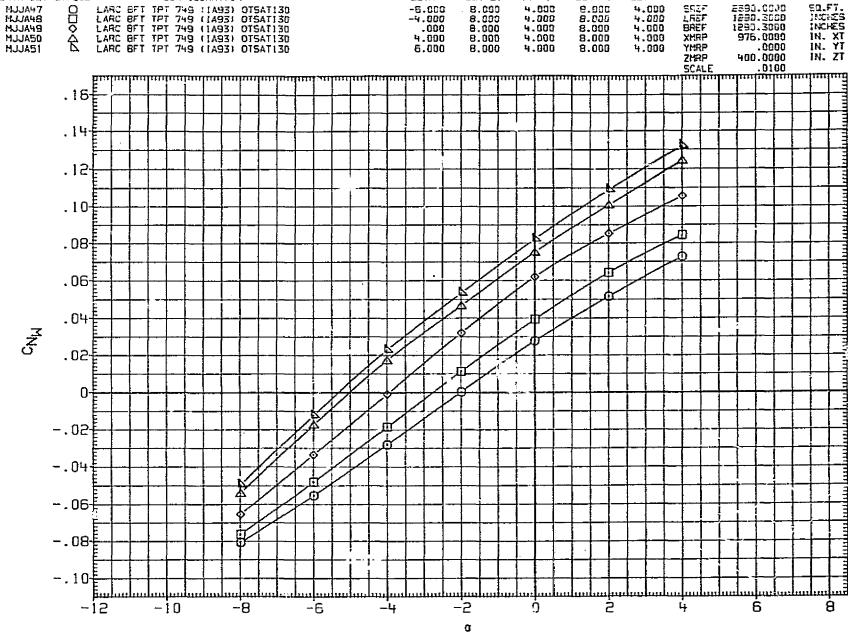


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



EETA

Et.V-LI

ELV-LO ELV-RI

ELV-RD

FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(D)MACH = 1.20

DATA SET SYMBOL

CONFIGURATION

PAGE 412

DEFERENCE INFORMATION

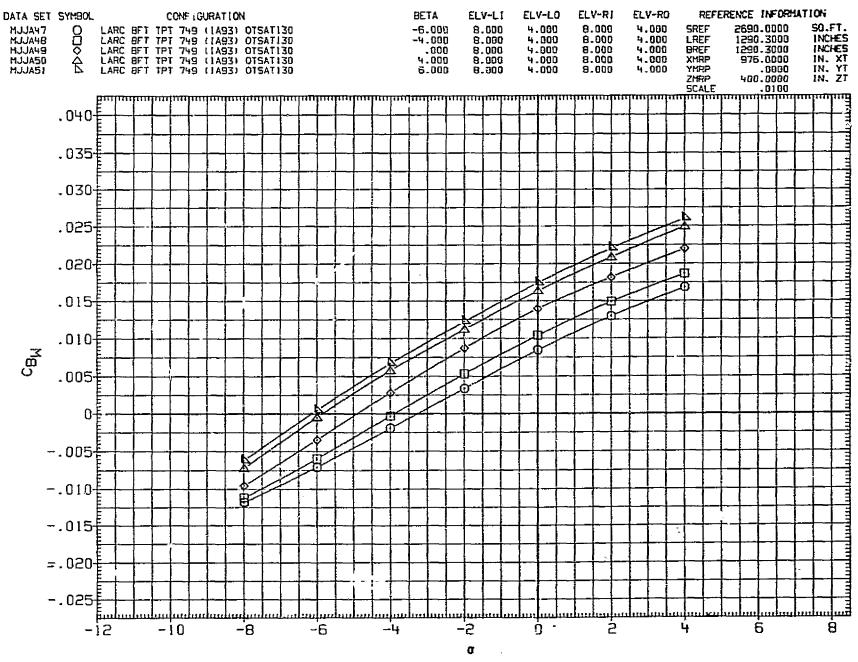


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

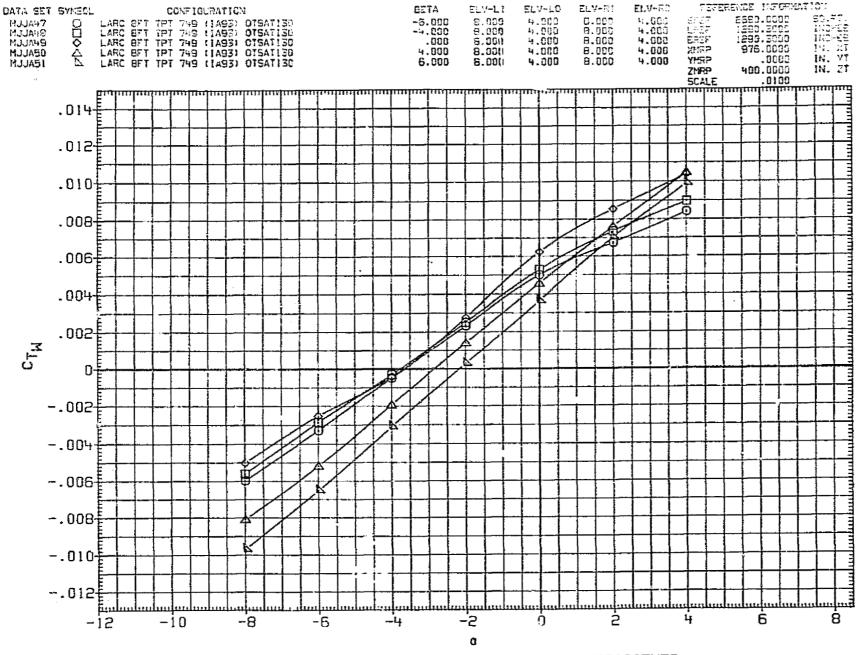


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

414

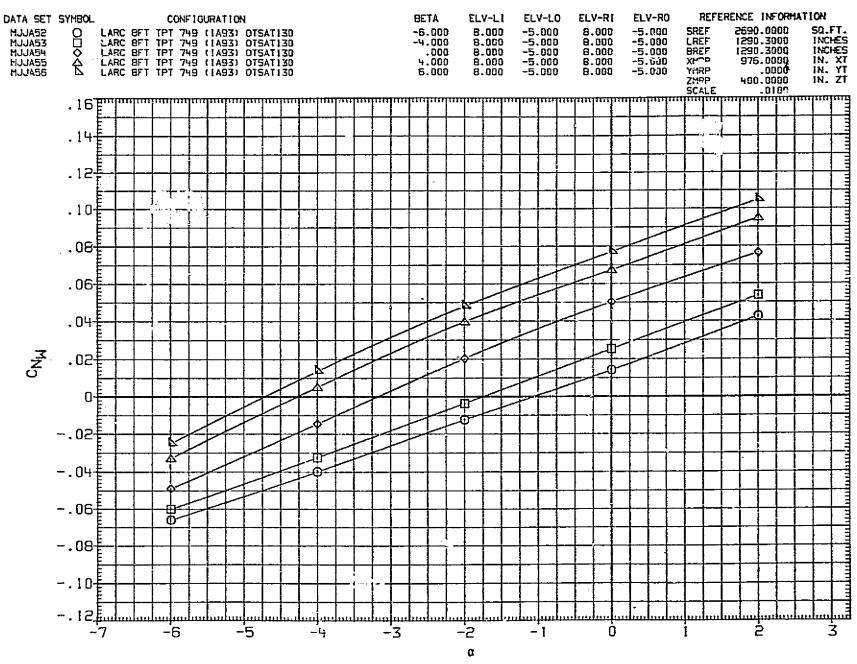


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



ELV-LI

ELV-RI

ELV-RO

REFERENCE INFORMATION

ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS FIG. 6

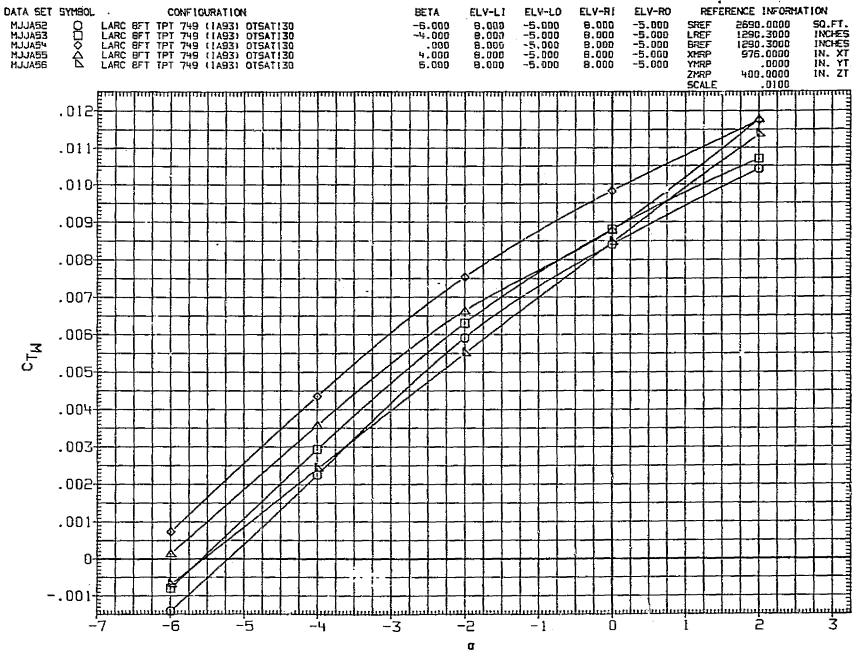


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

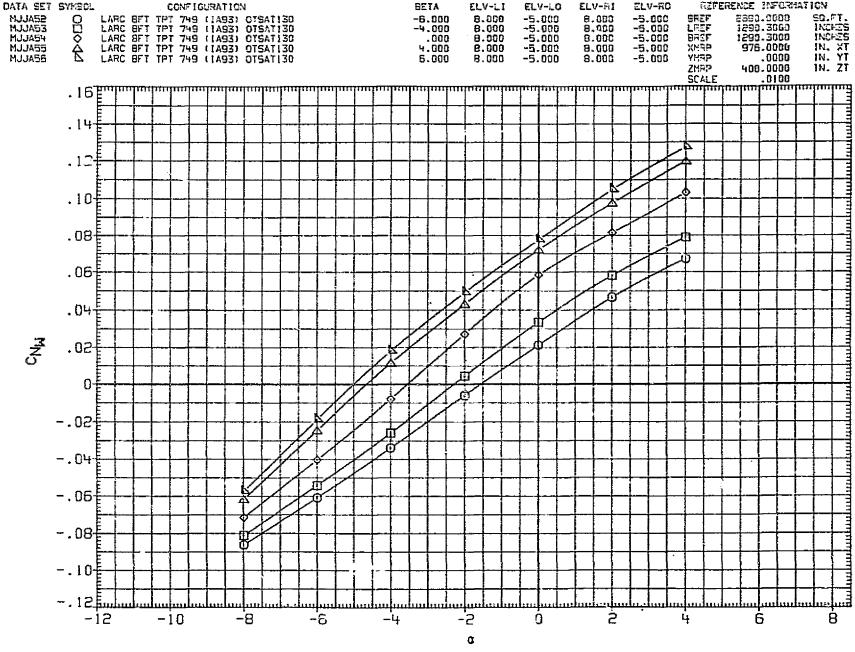


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(B)MACH = 1.20

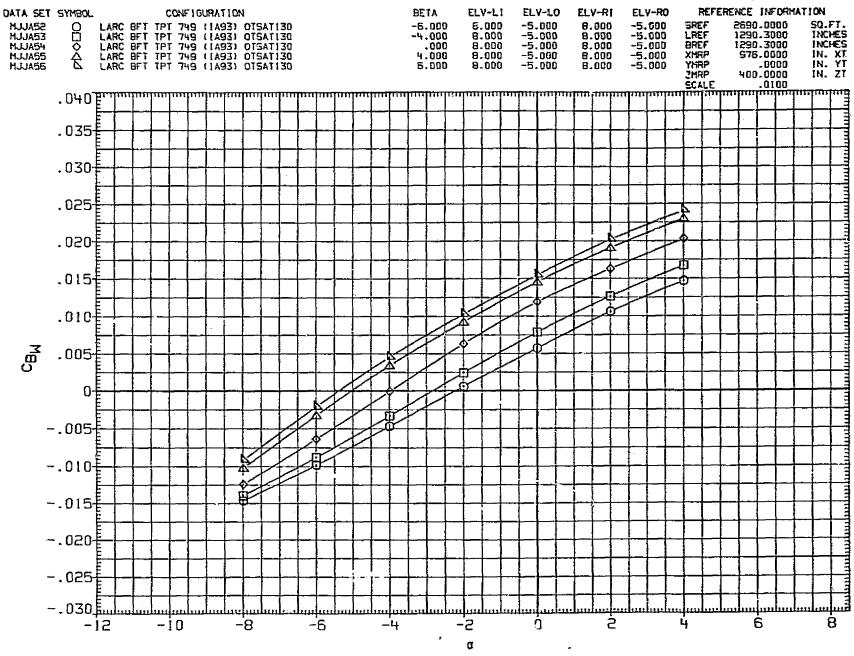


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

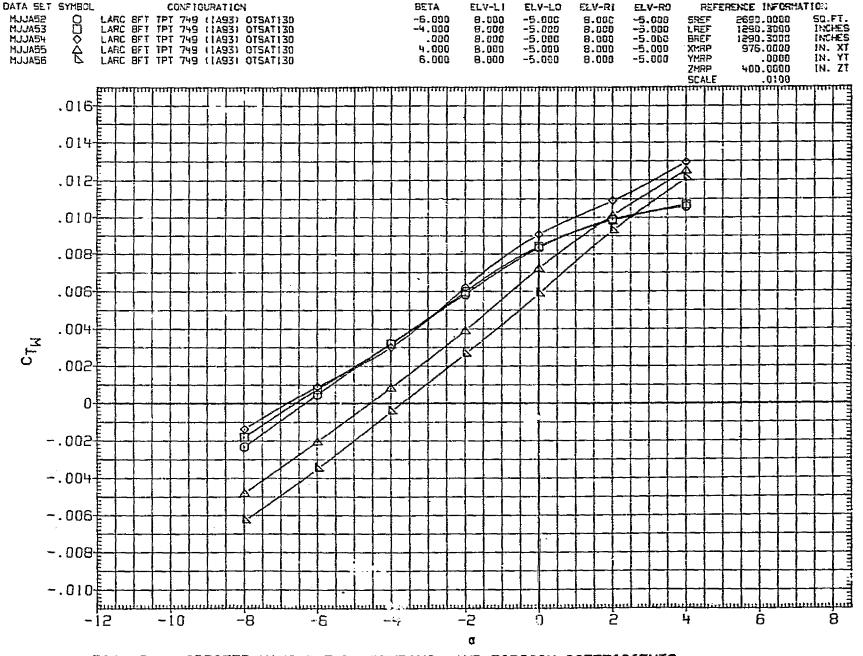


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(B) MACH = 1.20 PAGE

RPPRODUCIBILITY OF GRIGINAL PAGE IS PO

420

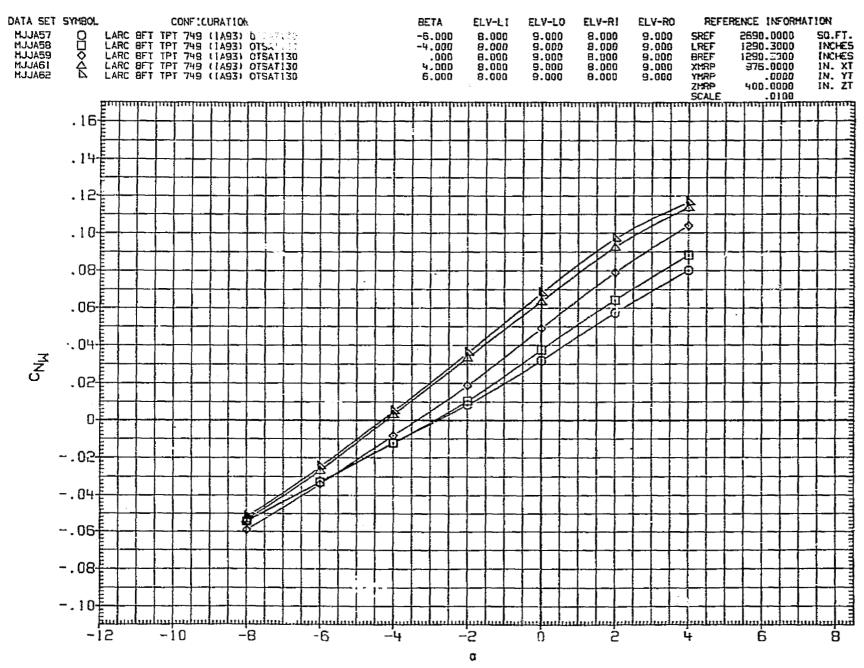


FIG. 6 ORBITER WING SHEAR, SENDING, AND TORSION COEFFICIENTS

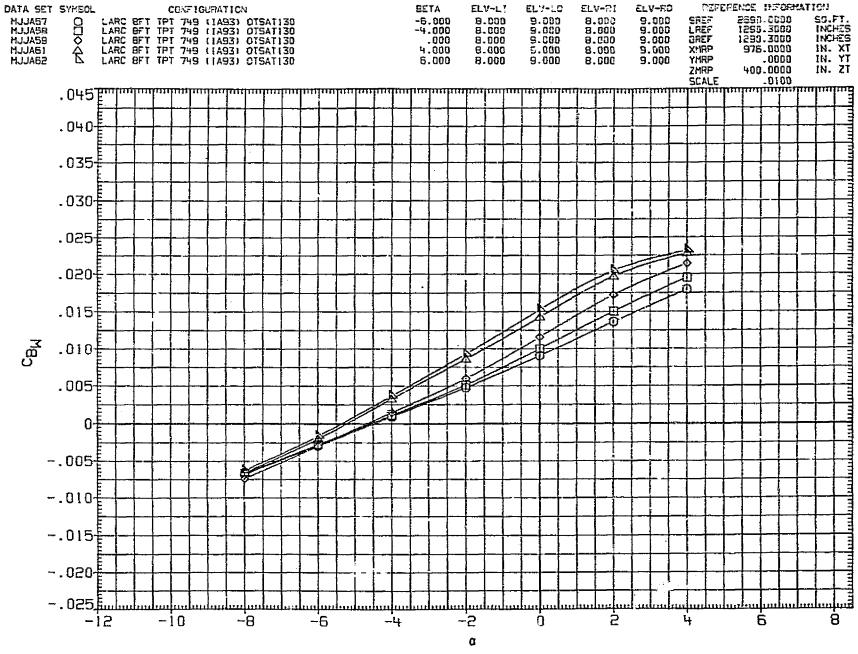


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A) MACH = .90 PAGE 422

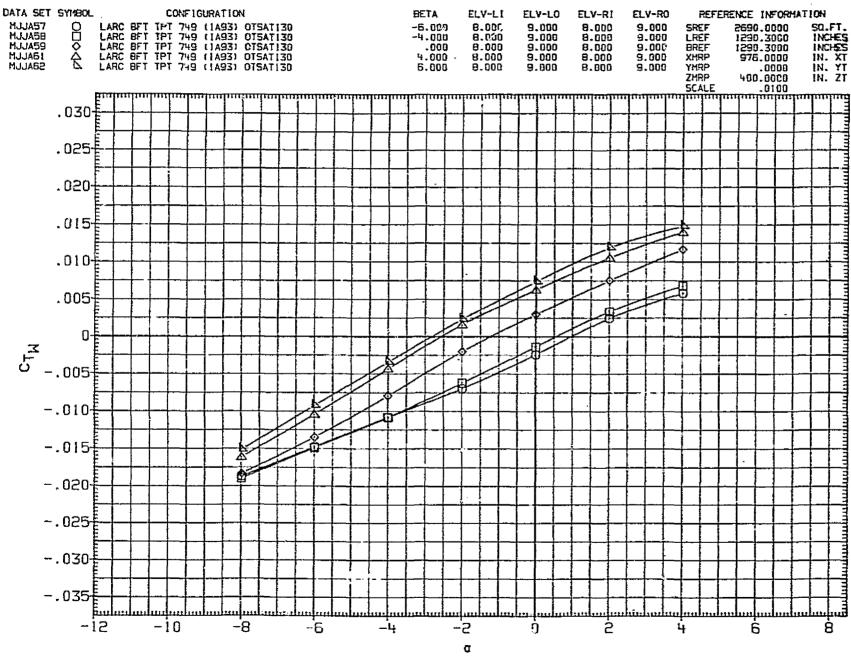


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(A)MACH = .90

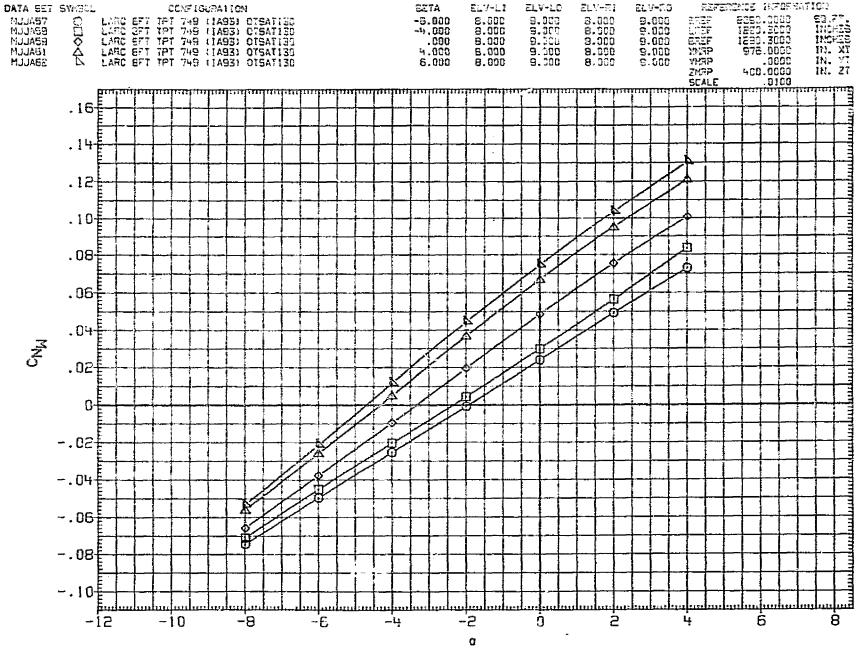


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

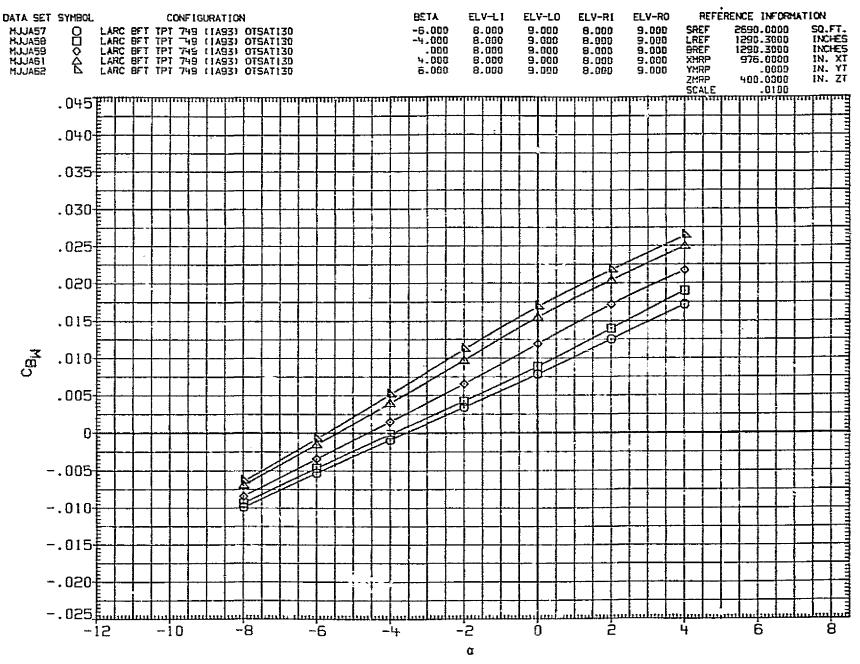


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

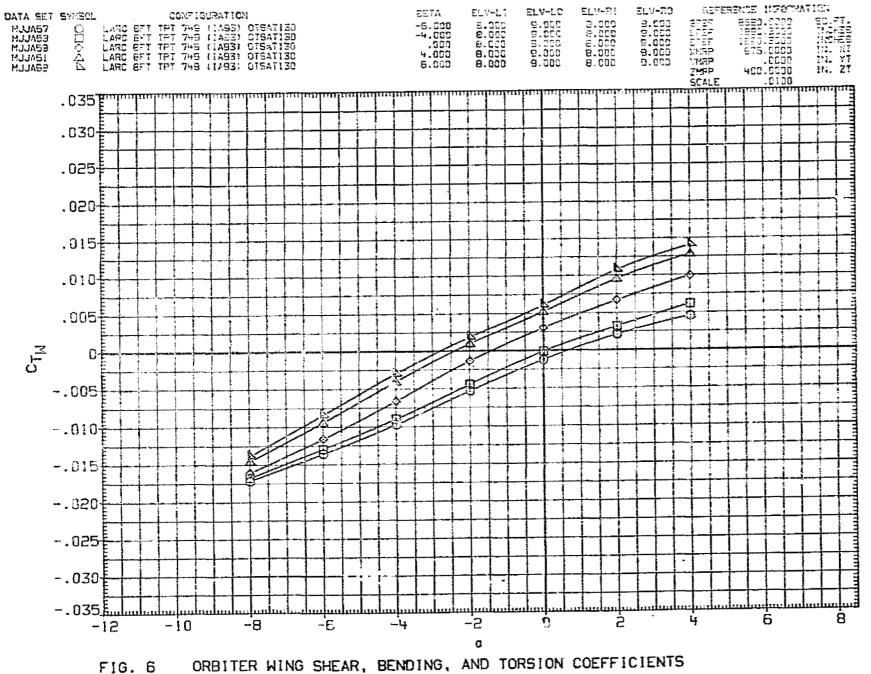


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(B) MACH = .98

PAGE 426

REPRODUCIBILITY OF GRIGINAL PAGE IS FO

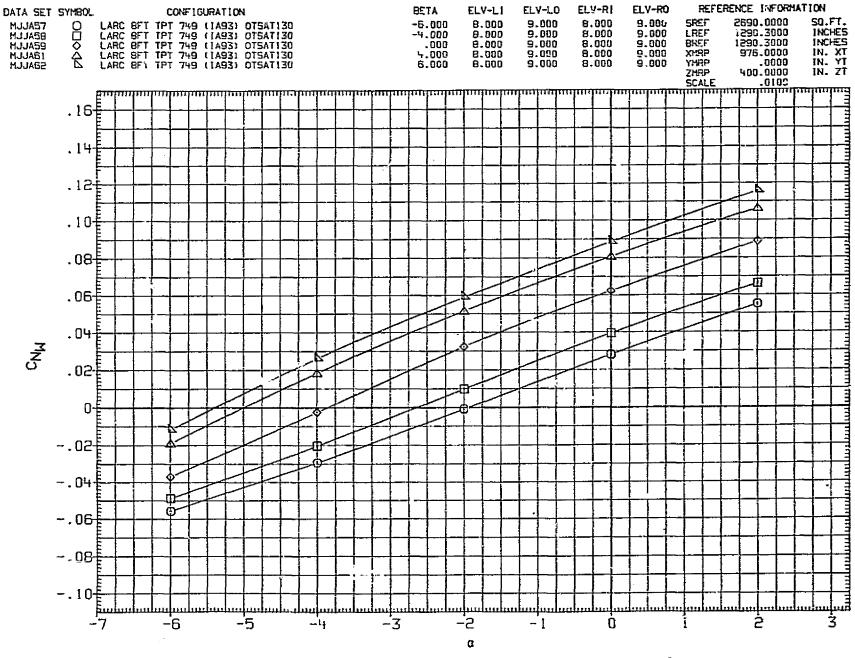


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

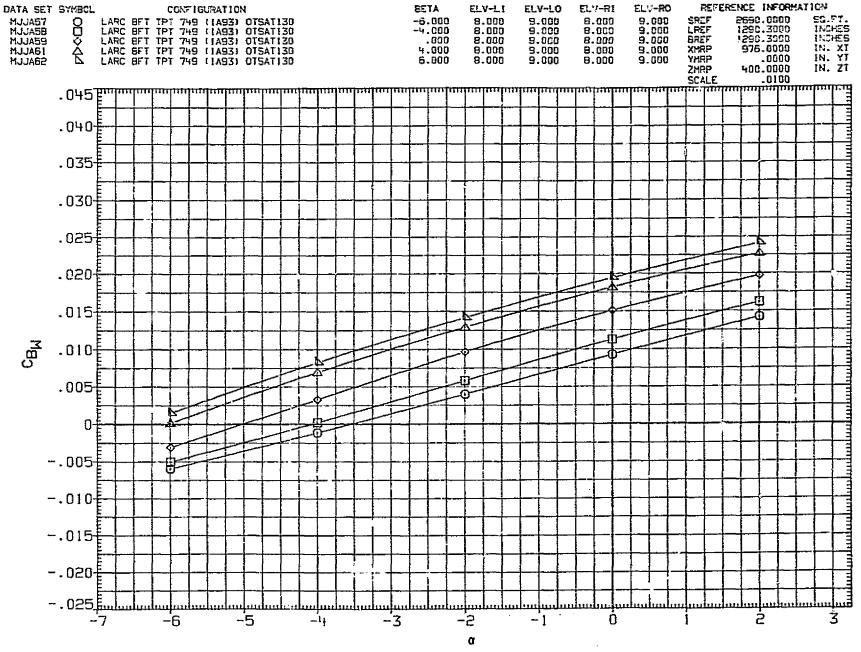


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

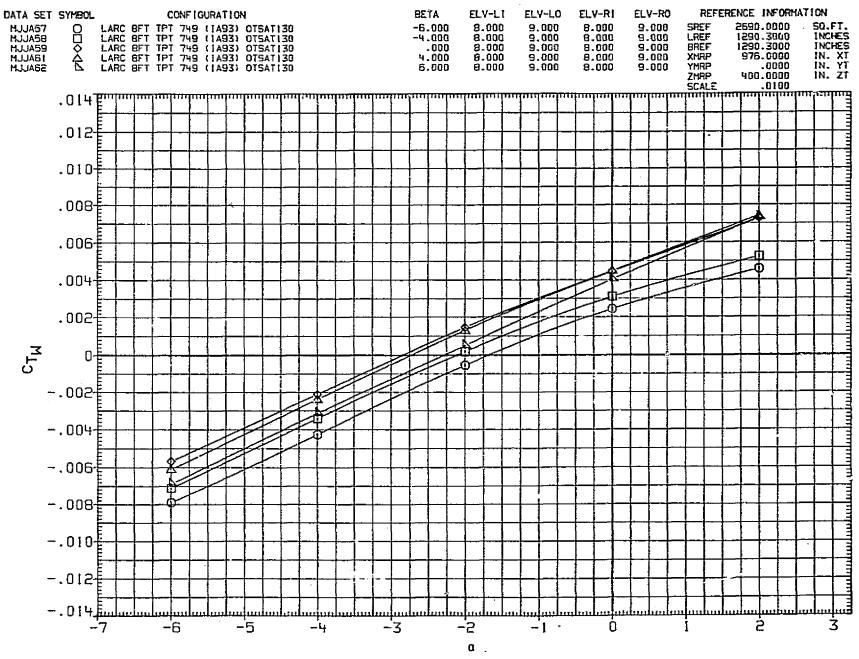
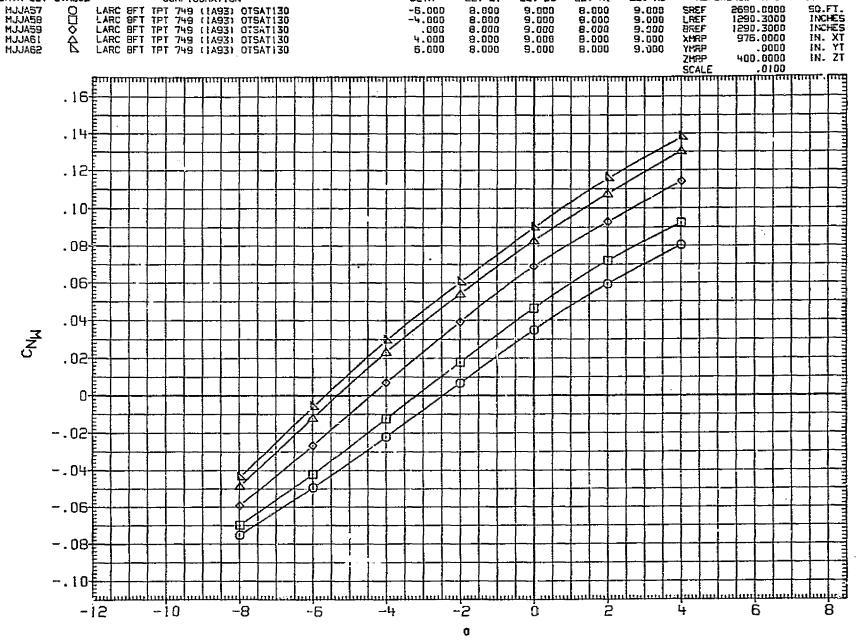


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS



BETA

ELV-LI

ELV-LO

ELV-RI

ELY-RO

FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

DATA SET SYMBOL

CONFIGURATION

REFERENCE INFORMATION

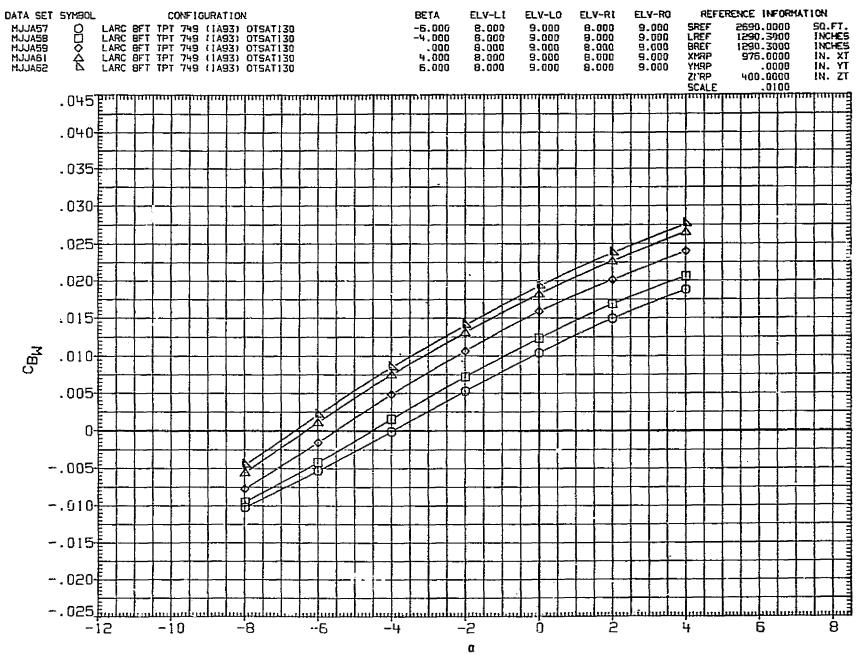


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

(D) MACH = 1.20 PAGE 431

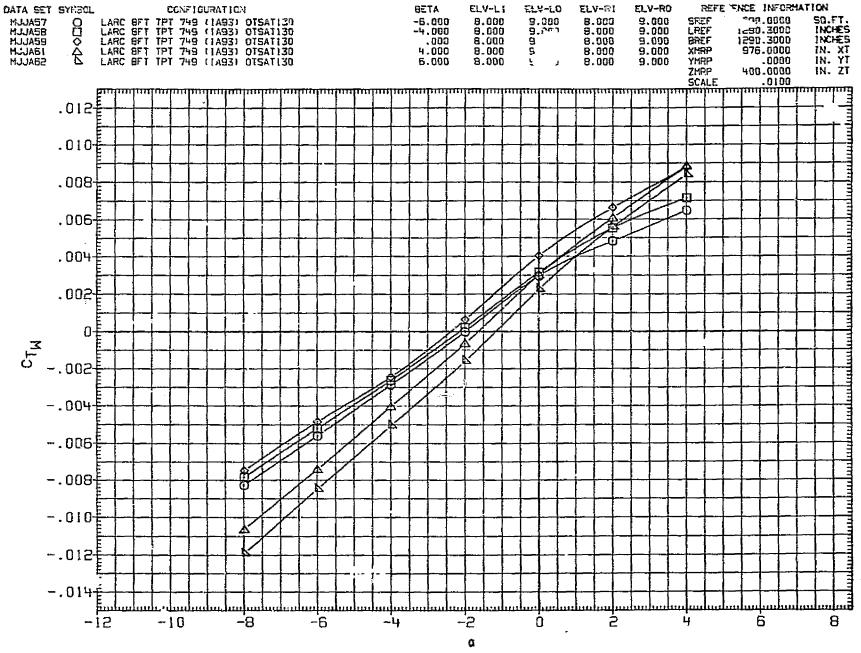


FIG. 6 ORBITER WING SHEAR, BENDING, AND TORSION COEFFICIENTS

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(D)MACH = 1.20

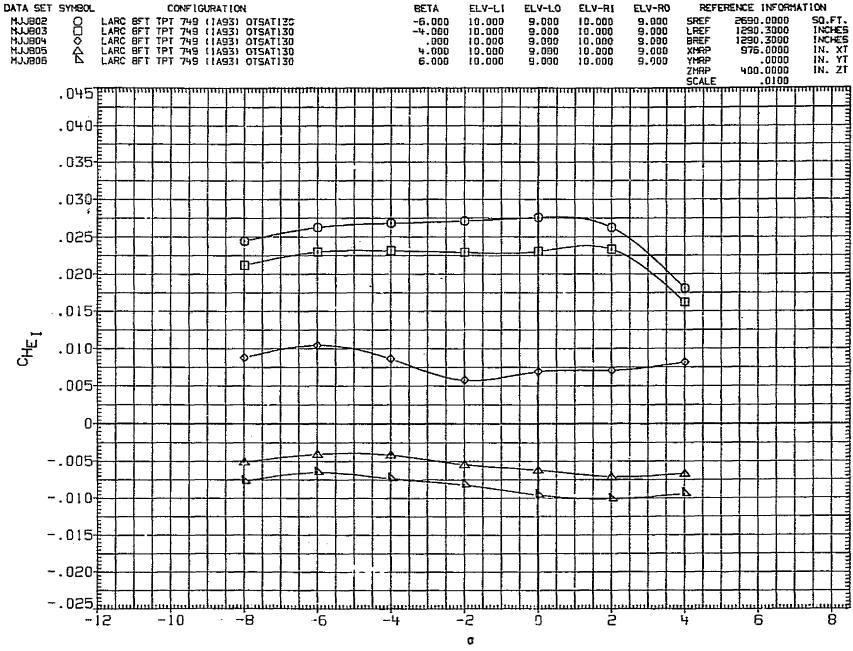


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

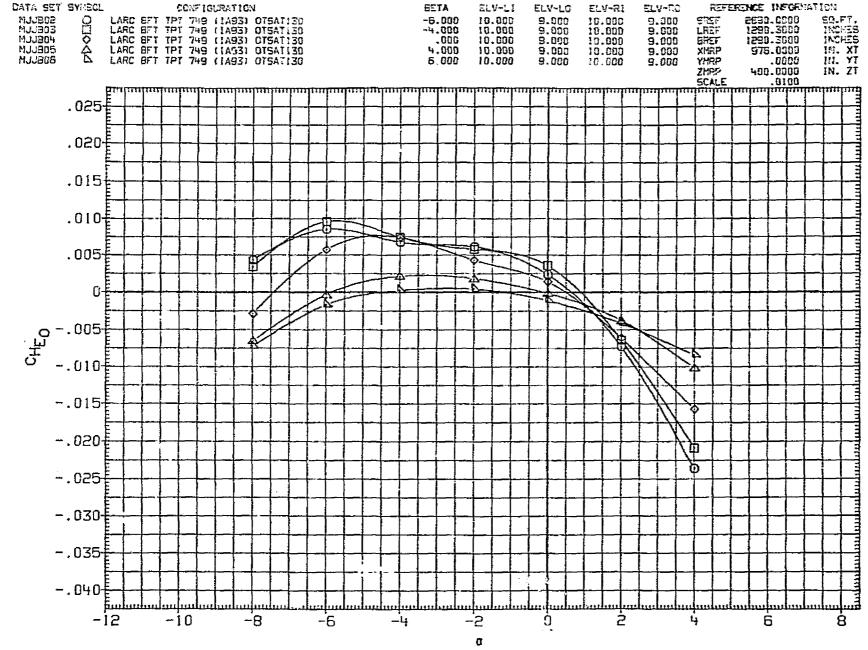


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = .90 PAGE +34

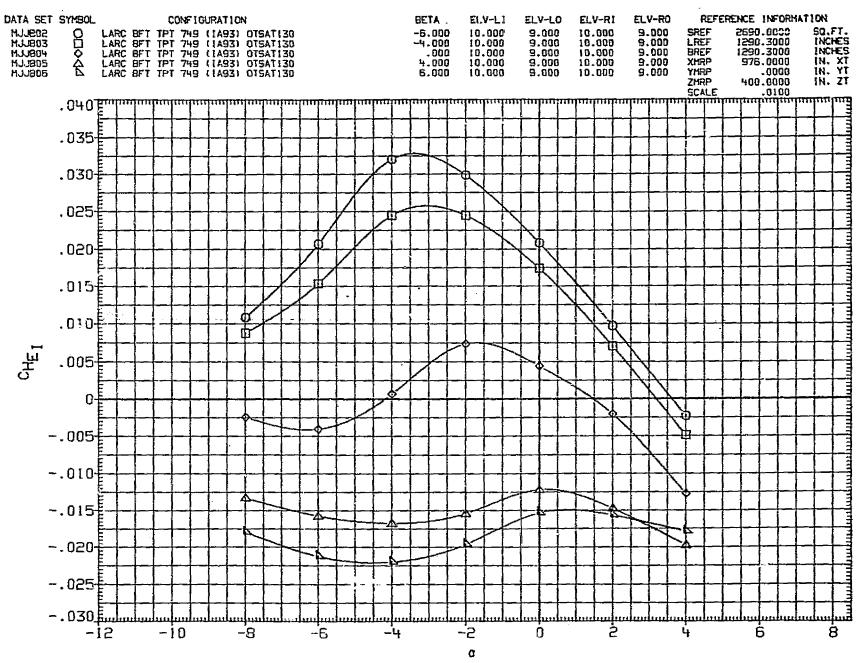


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

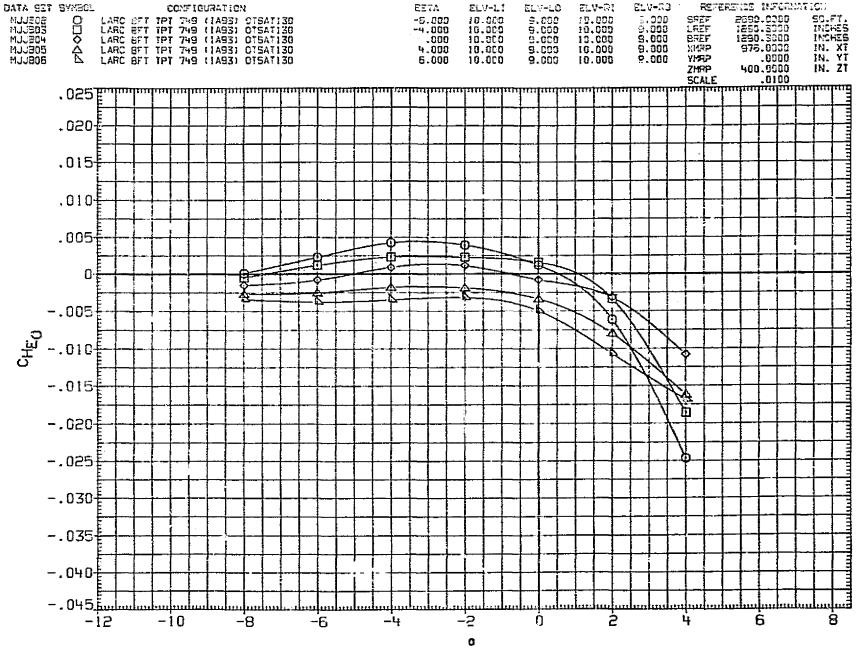


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B) MACH = .98 PAGE 436

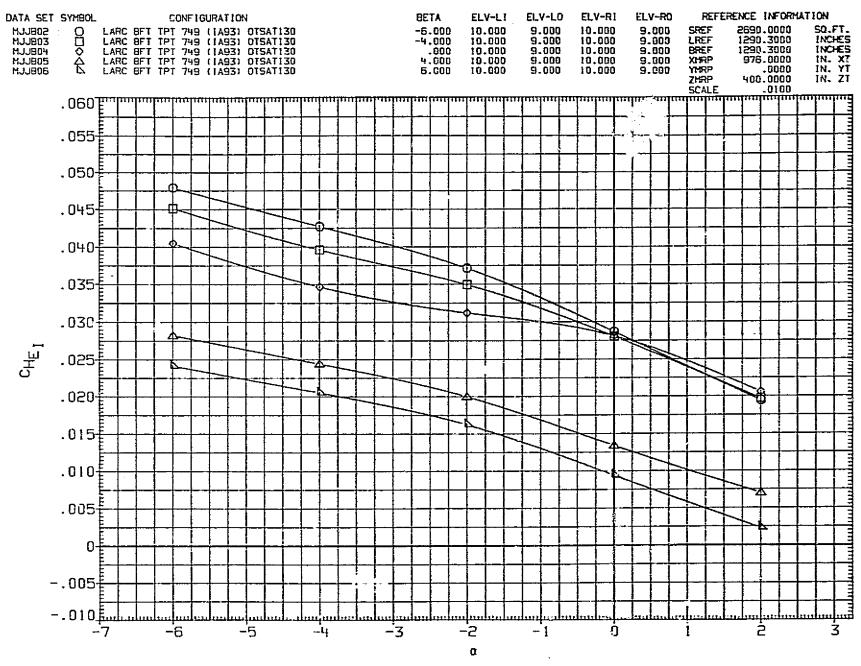


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(C)MACH = 1.15

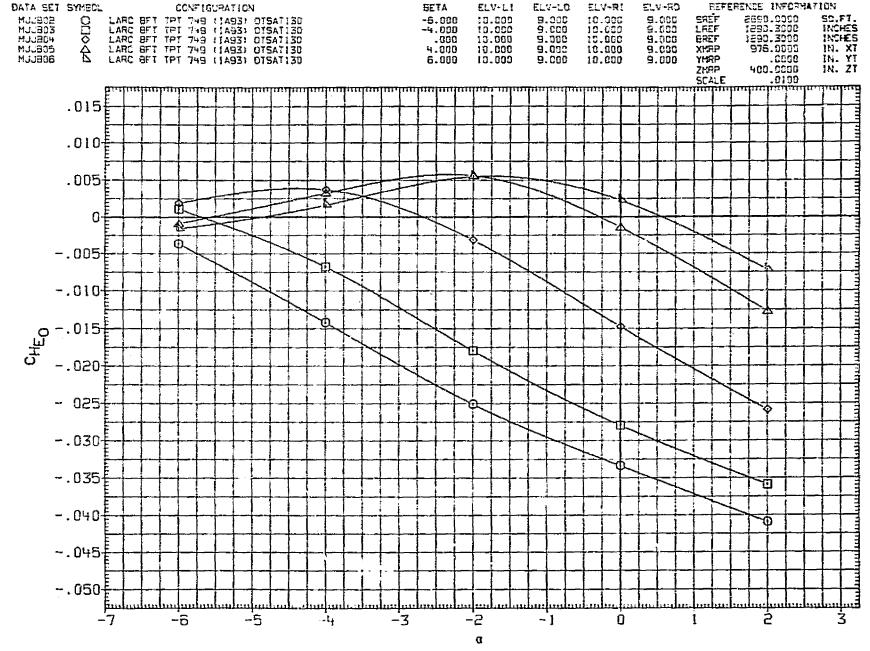


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(C)MACH = 1.15

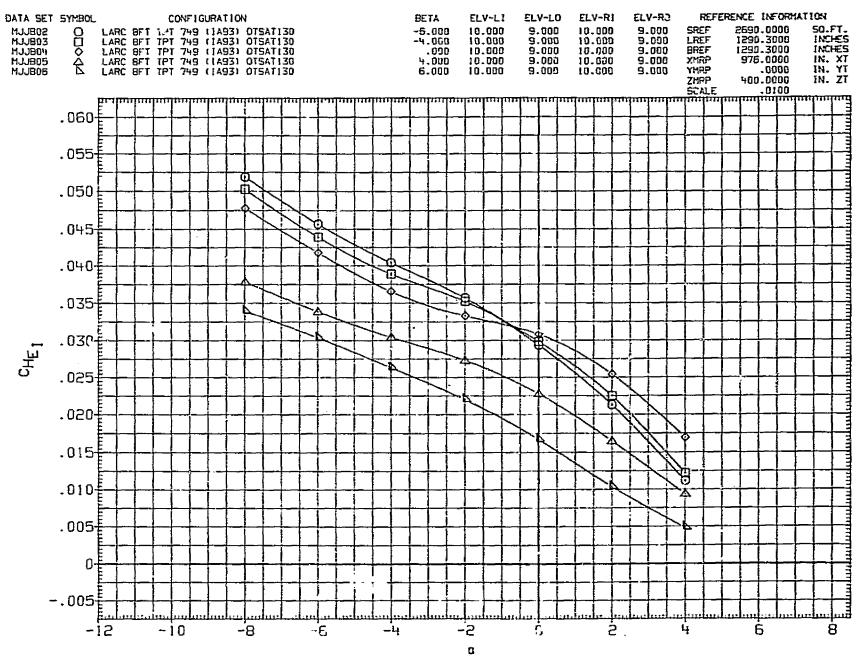


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(D) MACH = 1.20 PAGE 439



FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(D)MACH = 1.20 PAGE 440

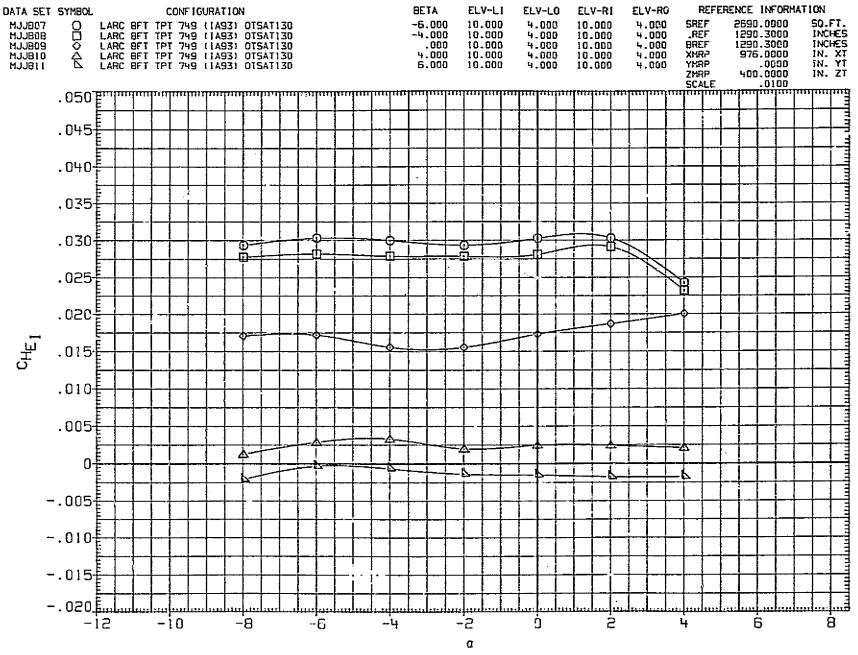


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = .90PAGE 441

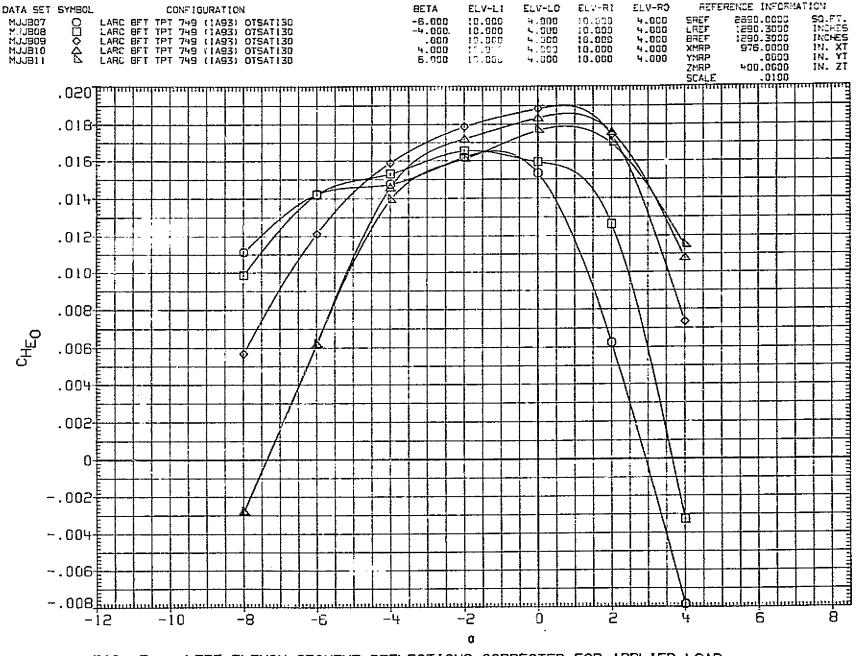


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = .90 PAGE 442

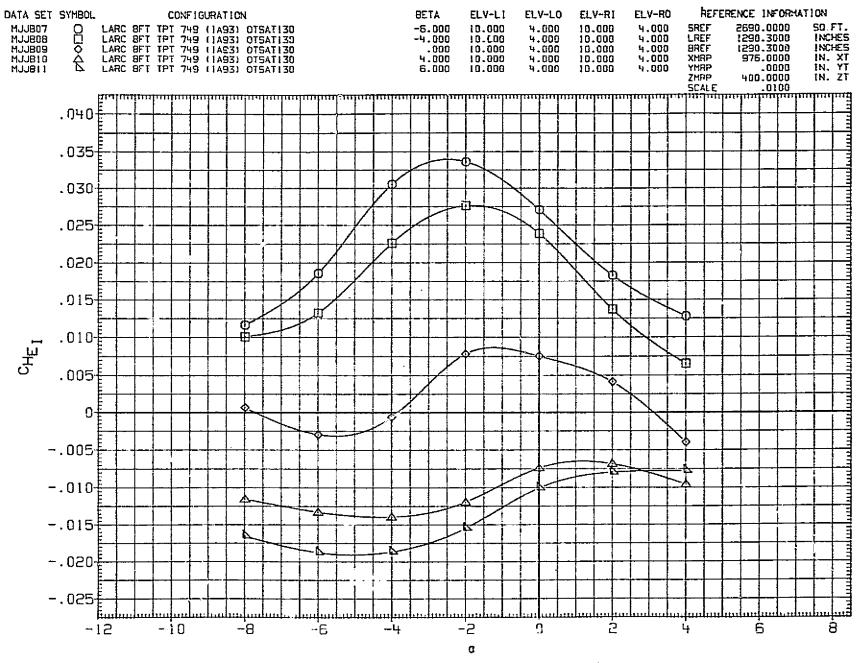


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

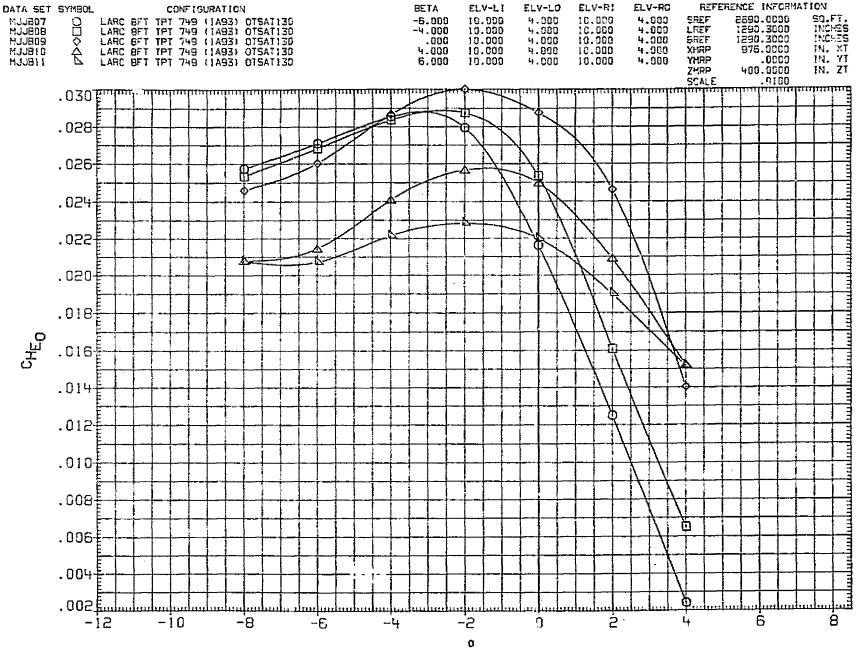


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

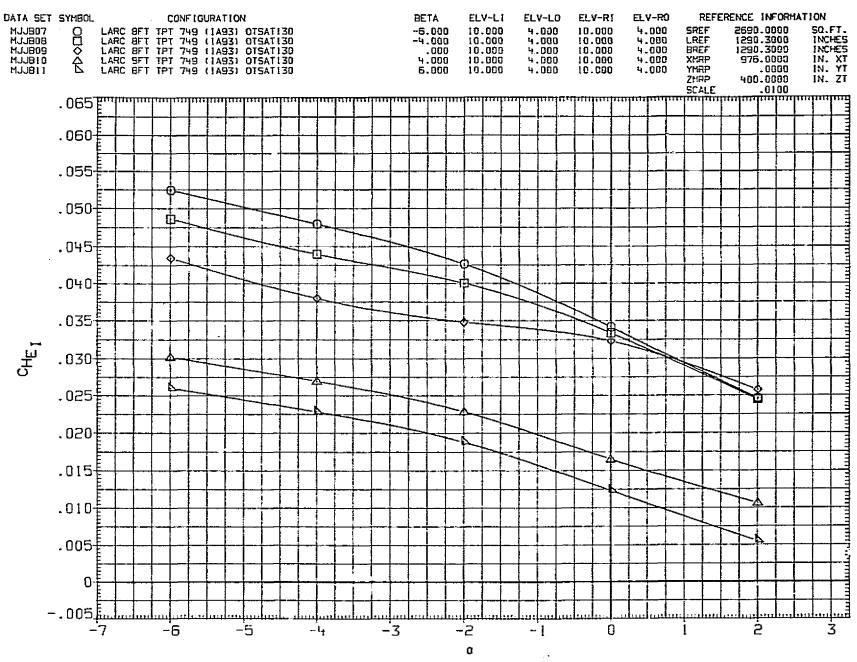


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

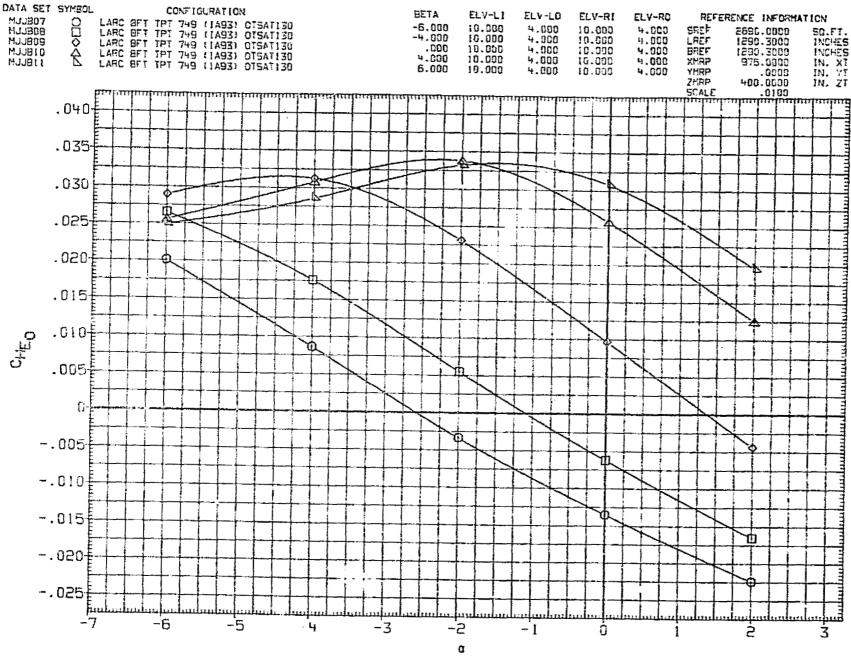


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(C)MACH = 1.15 PAGE 446

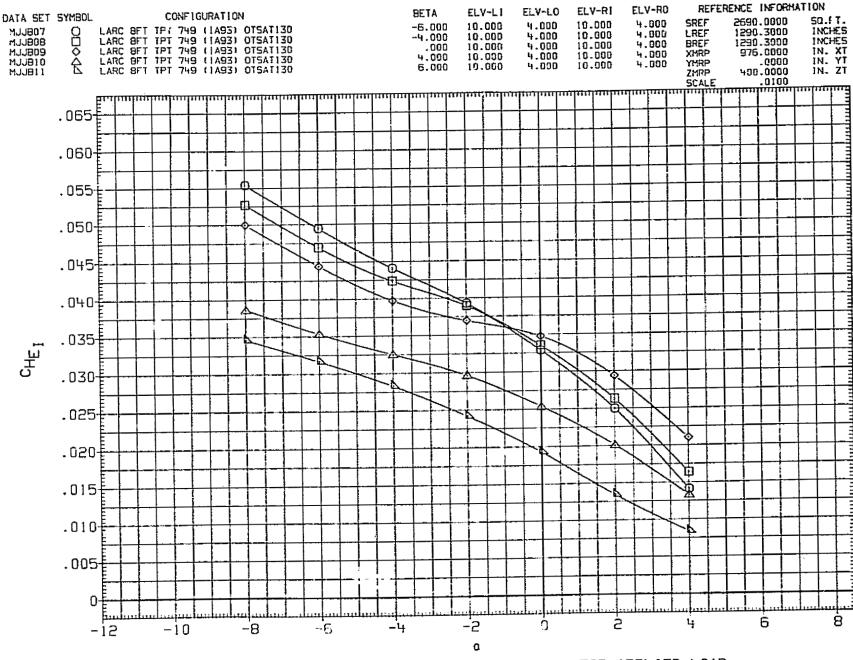


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

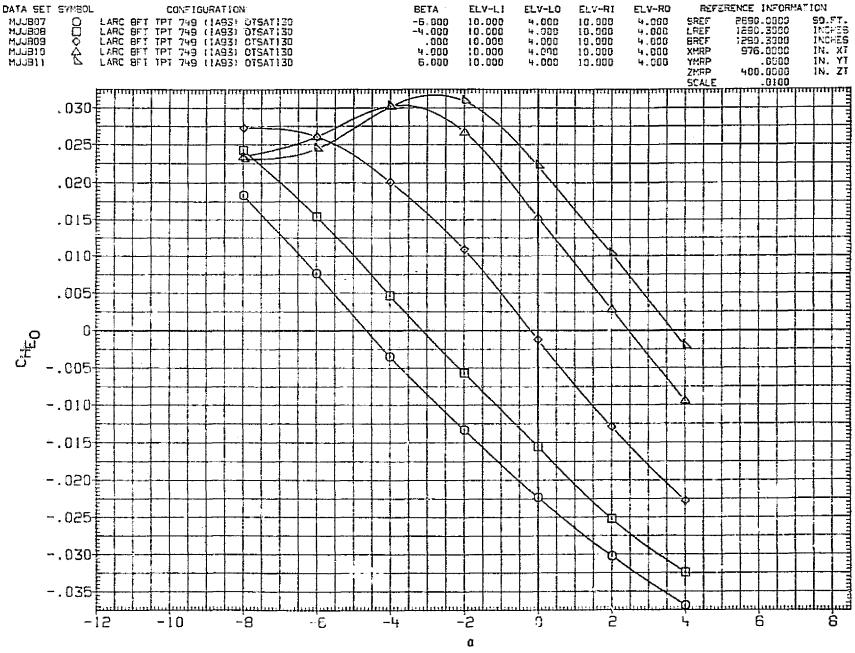


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(D)MACH = 1.20 PAGE 448

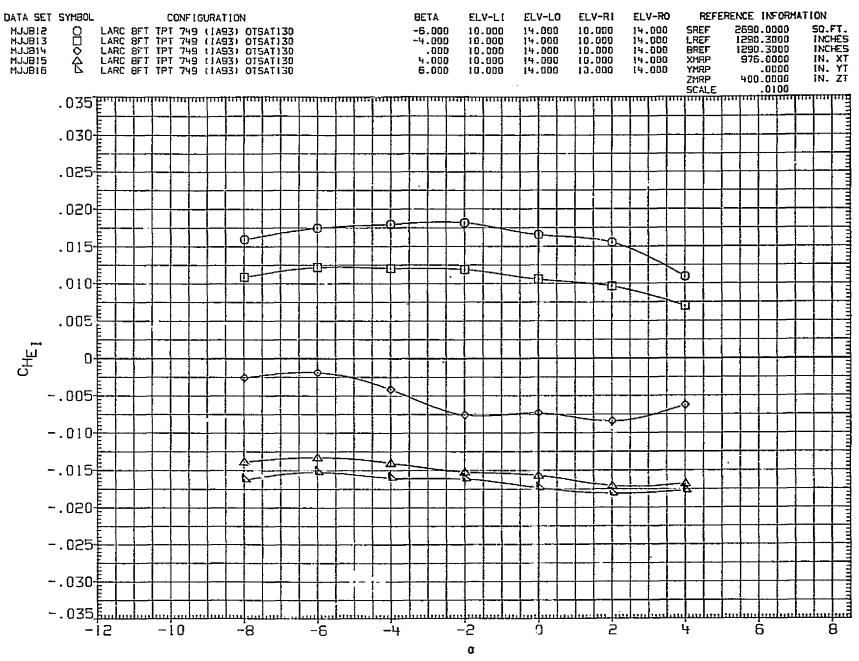


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

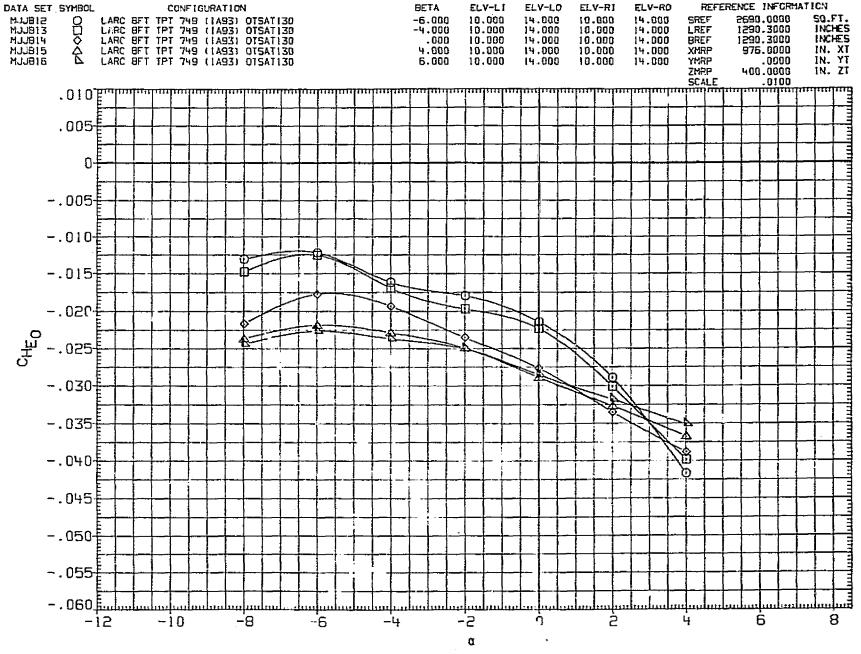


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

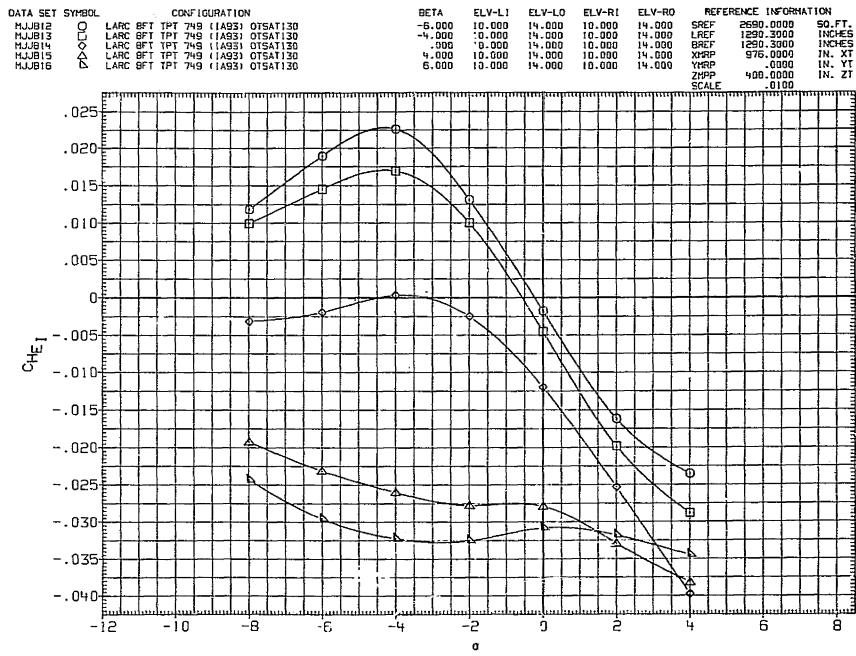


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

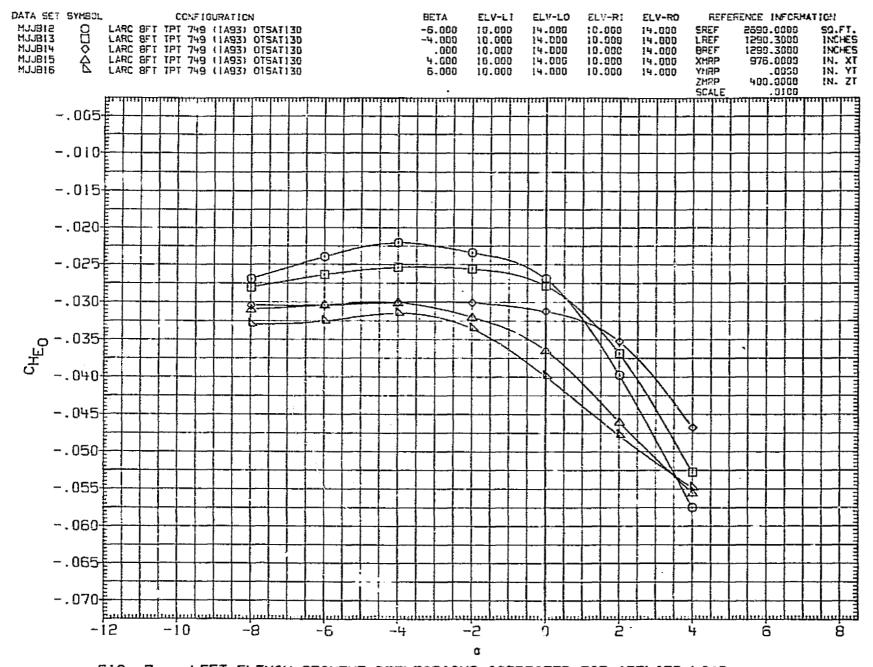


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B) MACH = .98 PAGE

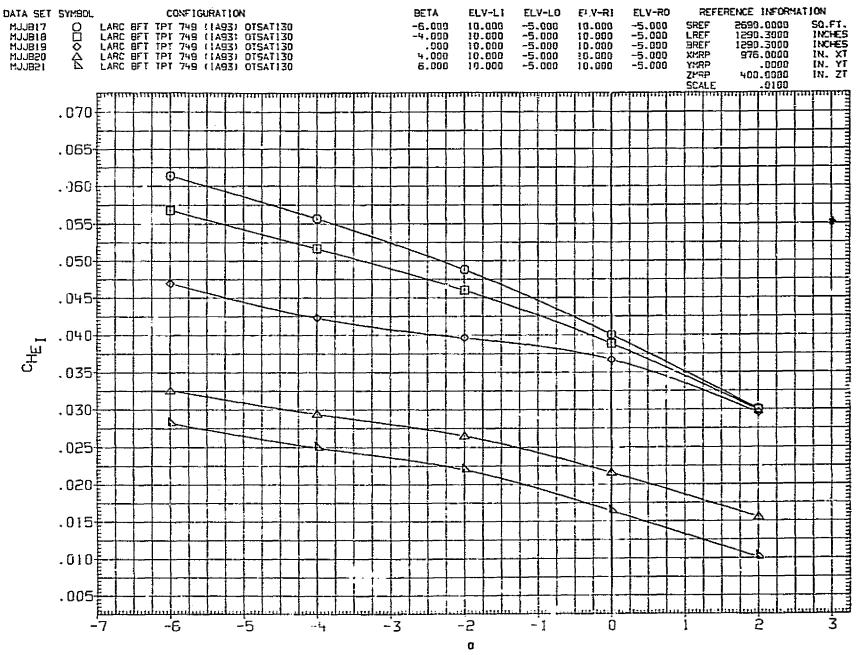


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS COFRECTED FOR APPLIED LOAD

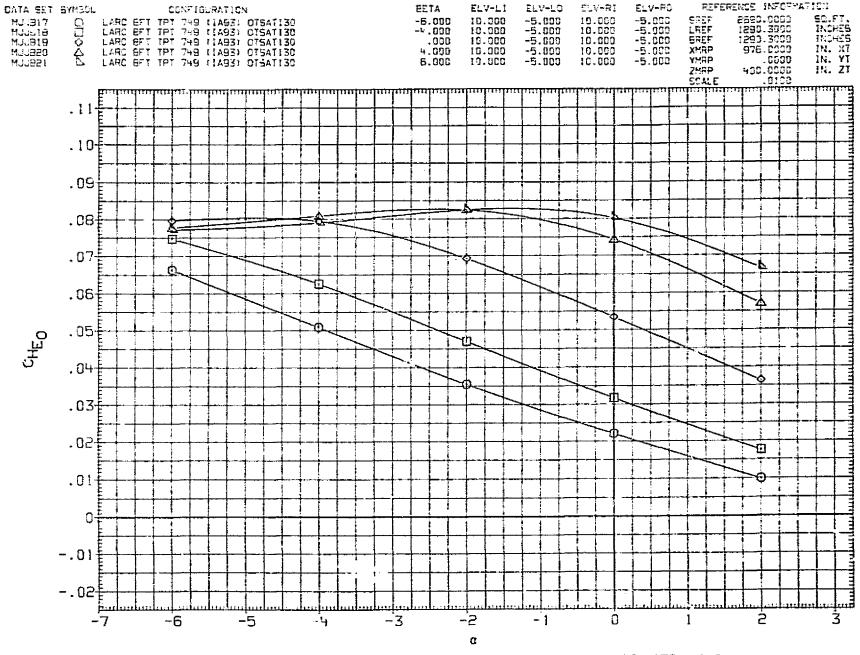


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = 1.15

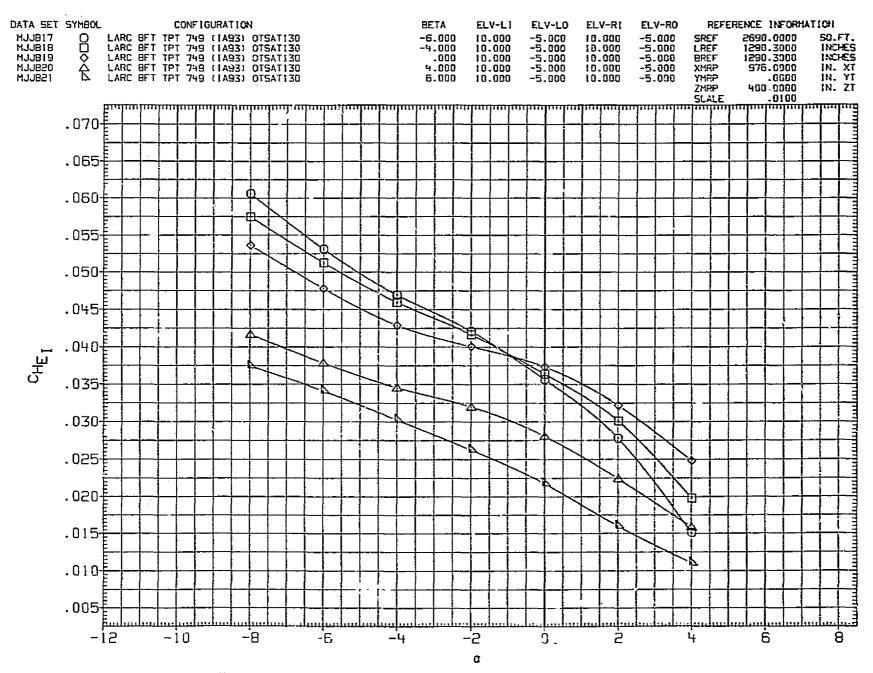


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B) MACH = 1.20 PAGE 455

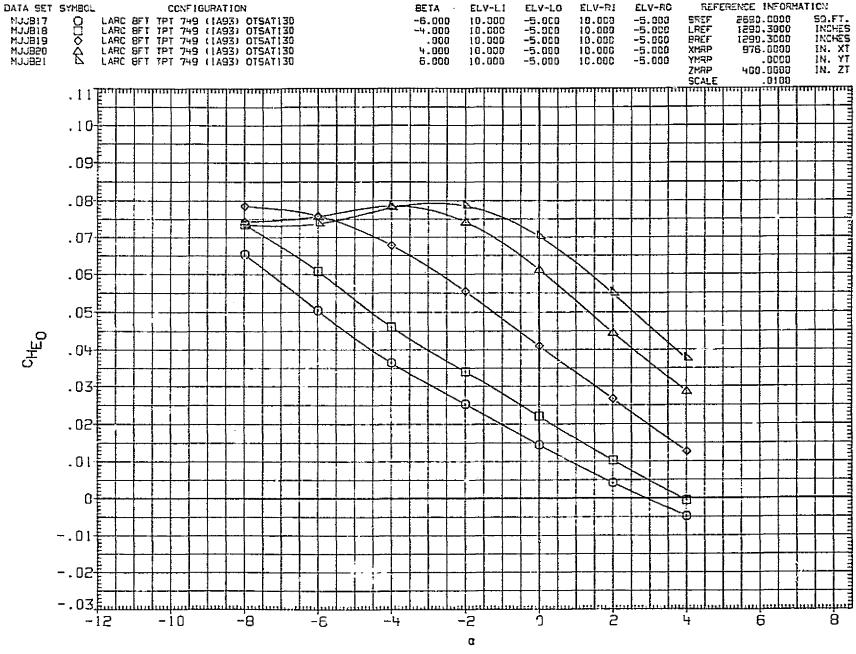


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B)MACH = 1.20

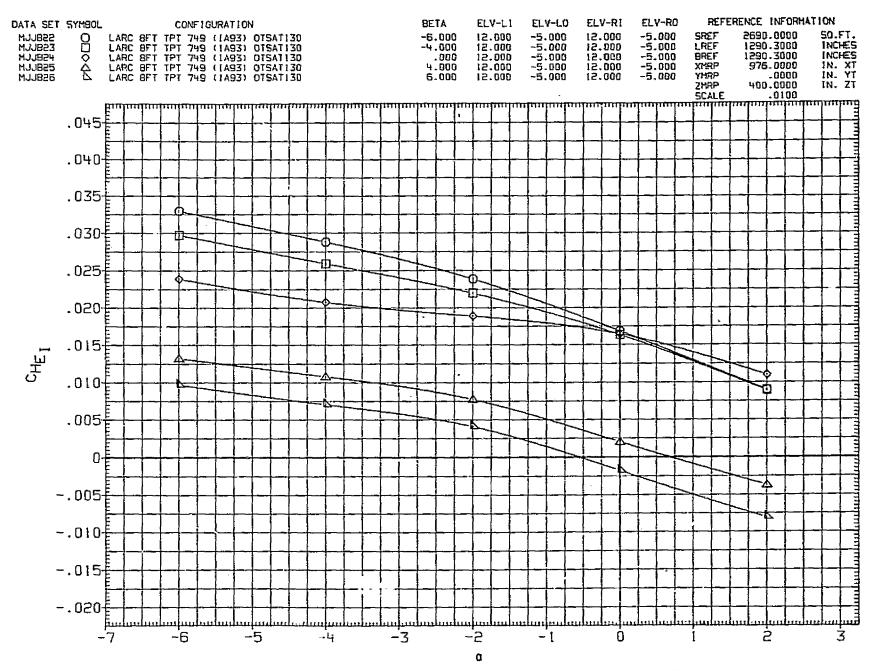


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

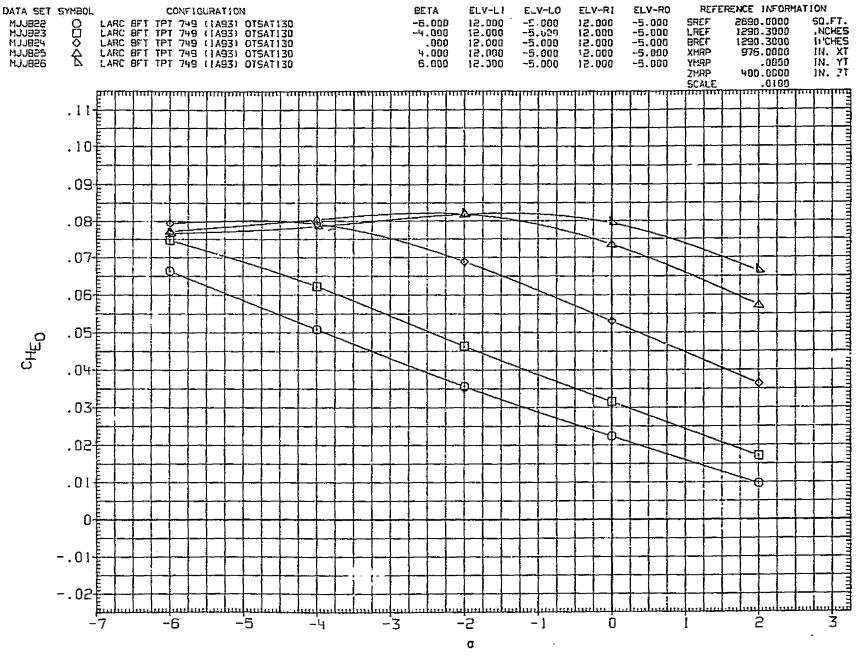


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIEJ LOAD

(A) MACH = 1.15

PAGE

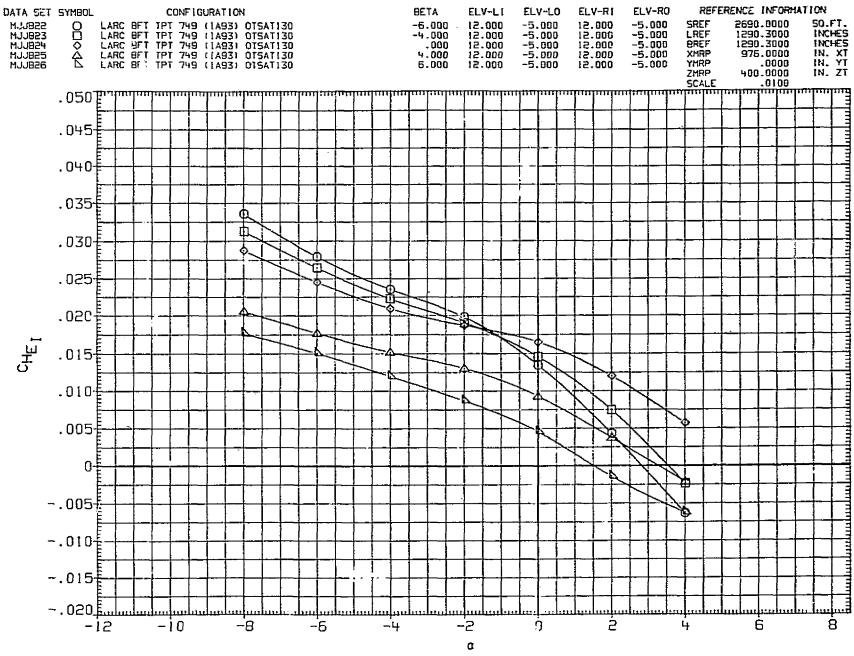


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

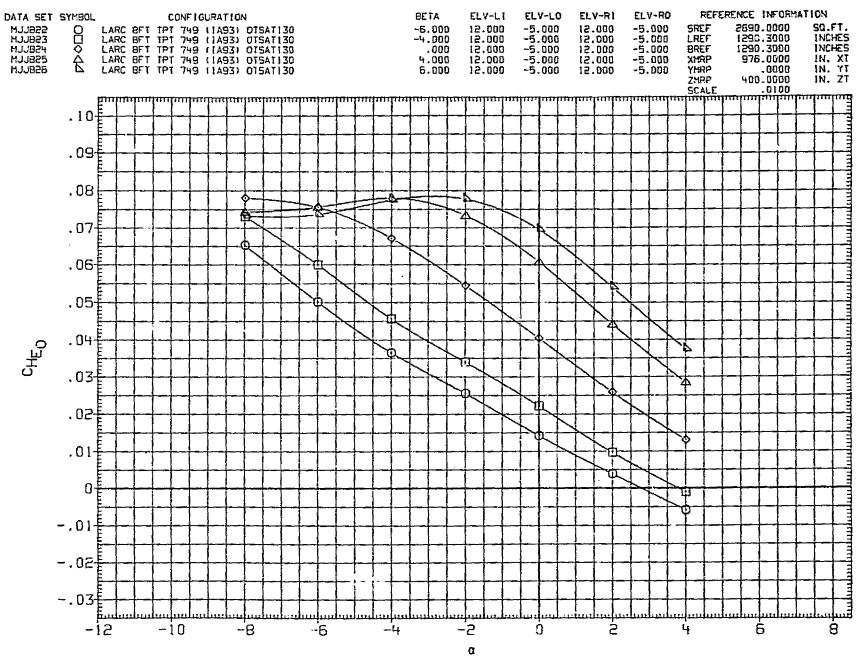


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

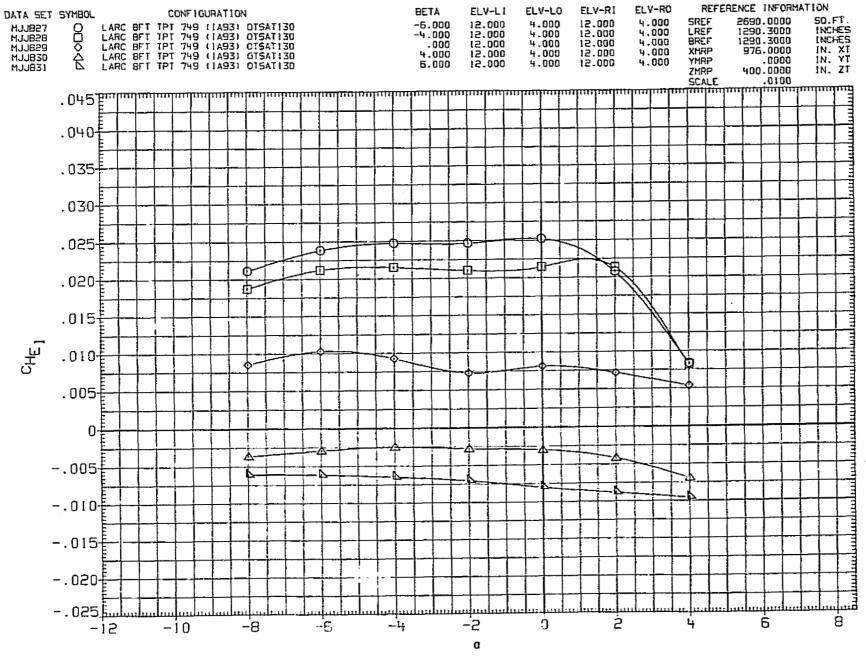


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

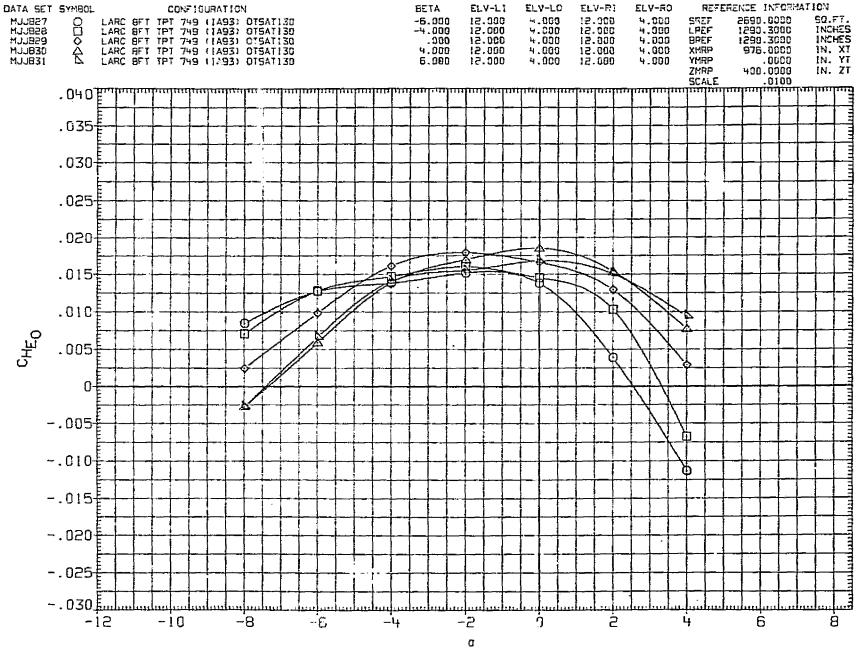


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = .90 PAGE 462

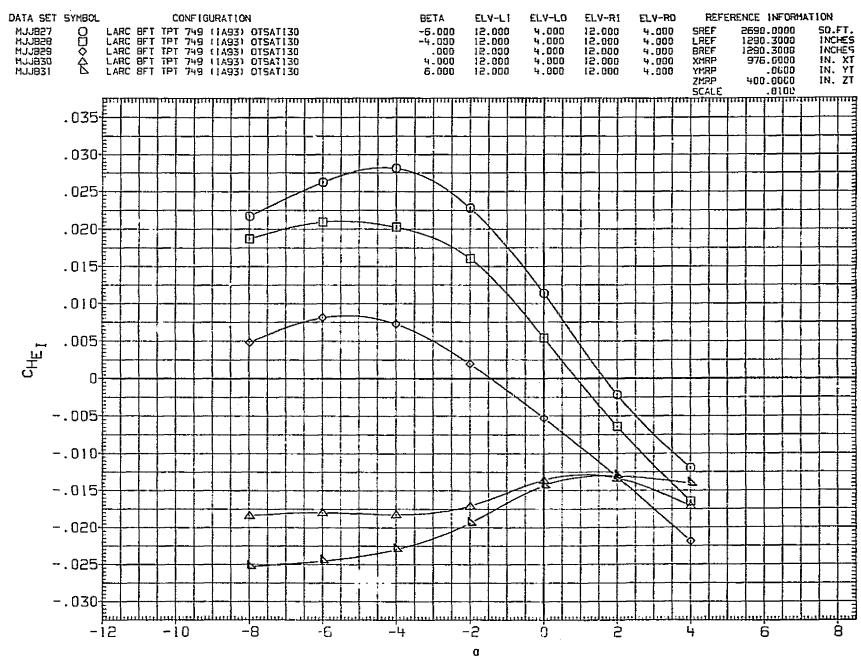


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

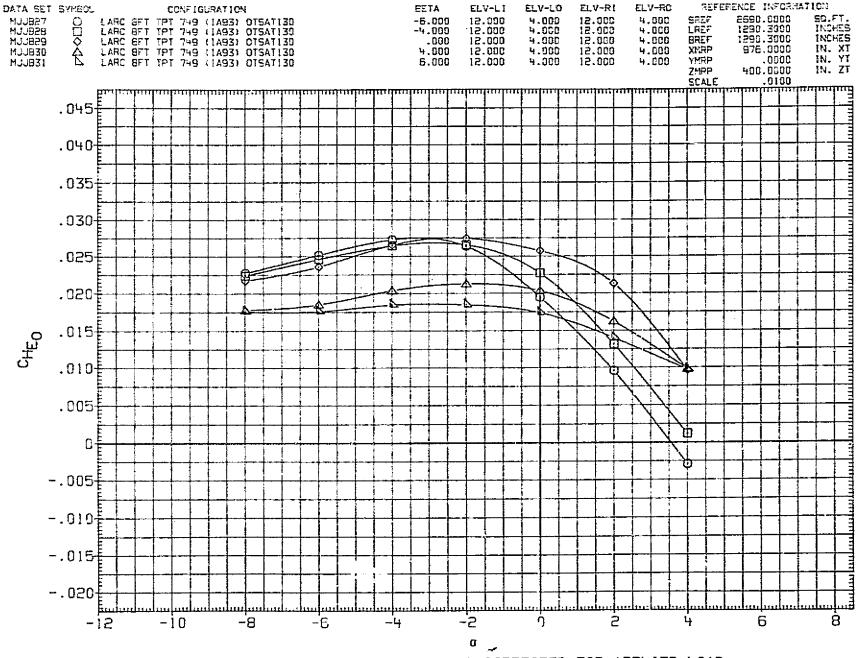


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B) MACH = .98 PAGE

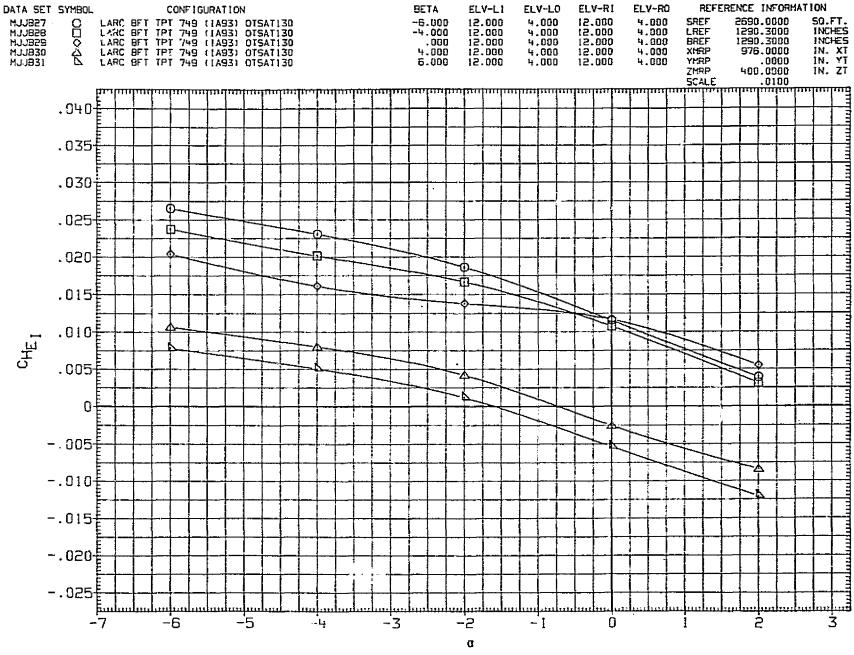


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(C)MACH = 1.15 PAGE 465

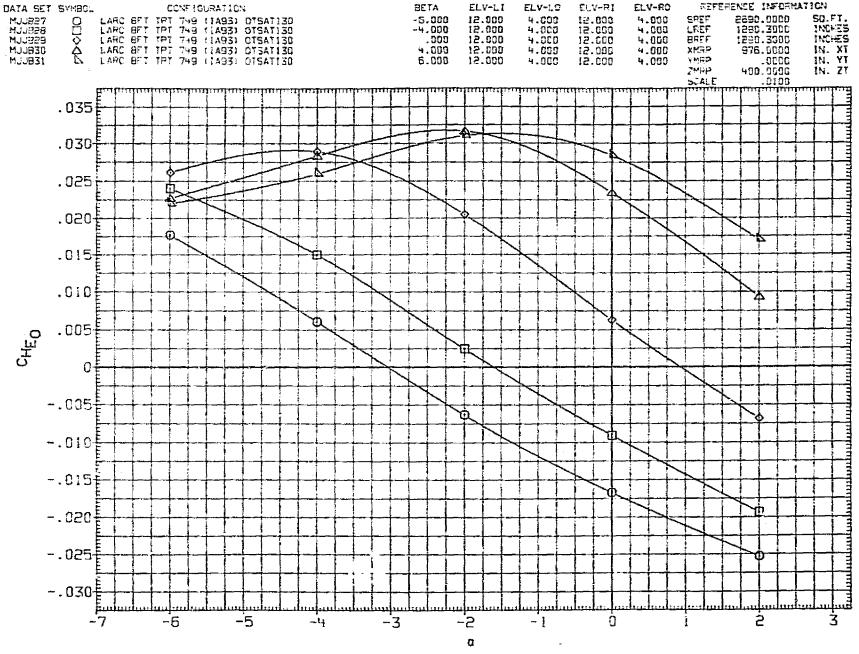


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

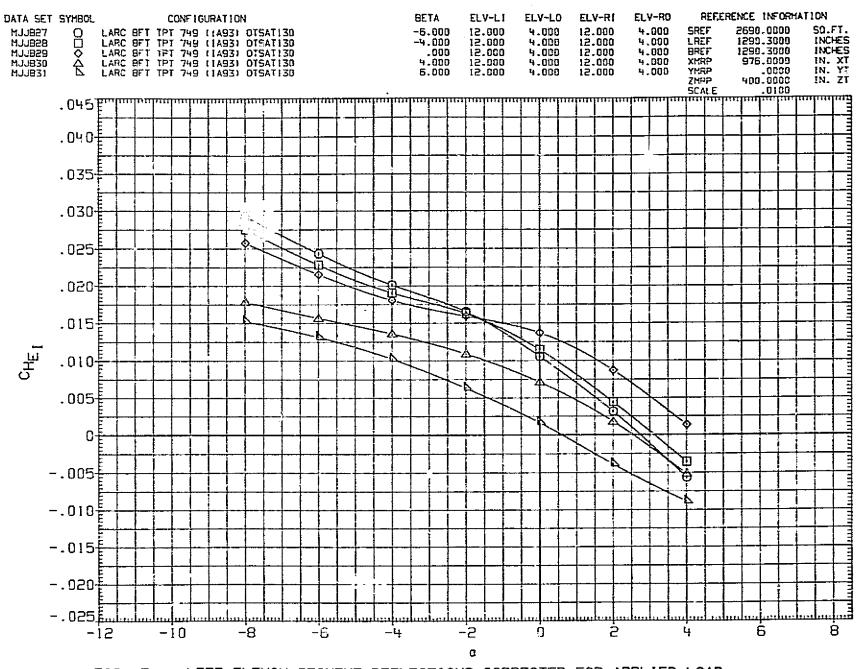


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

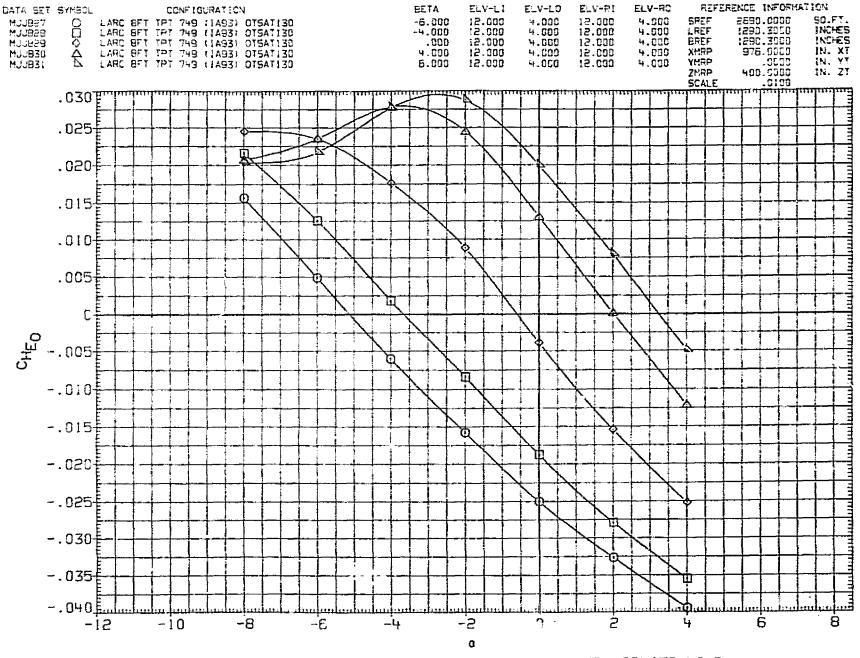
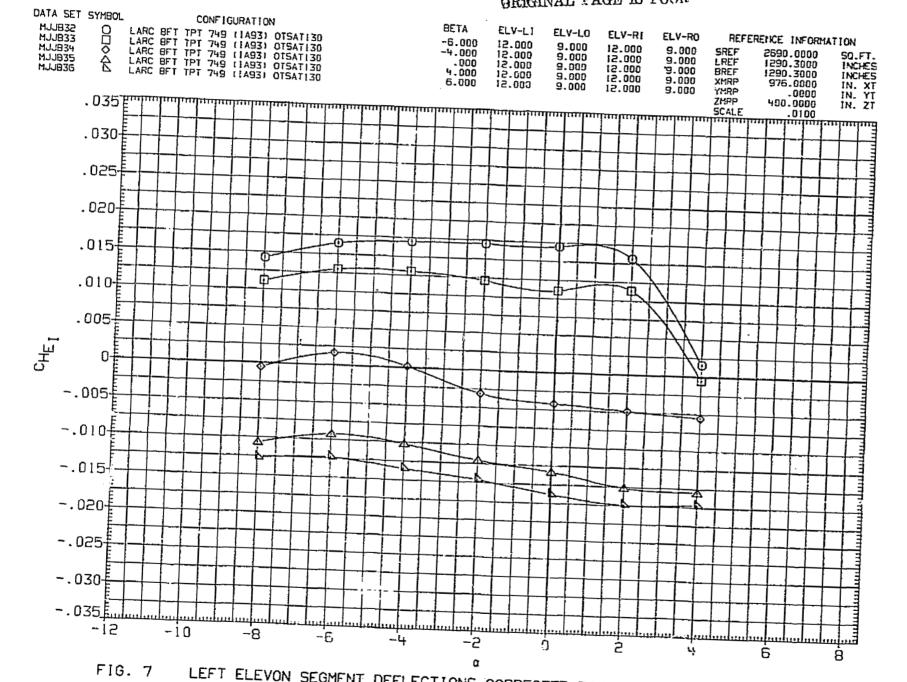


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(D) MACH = 1.20 PAGE 468

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR



LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

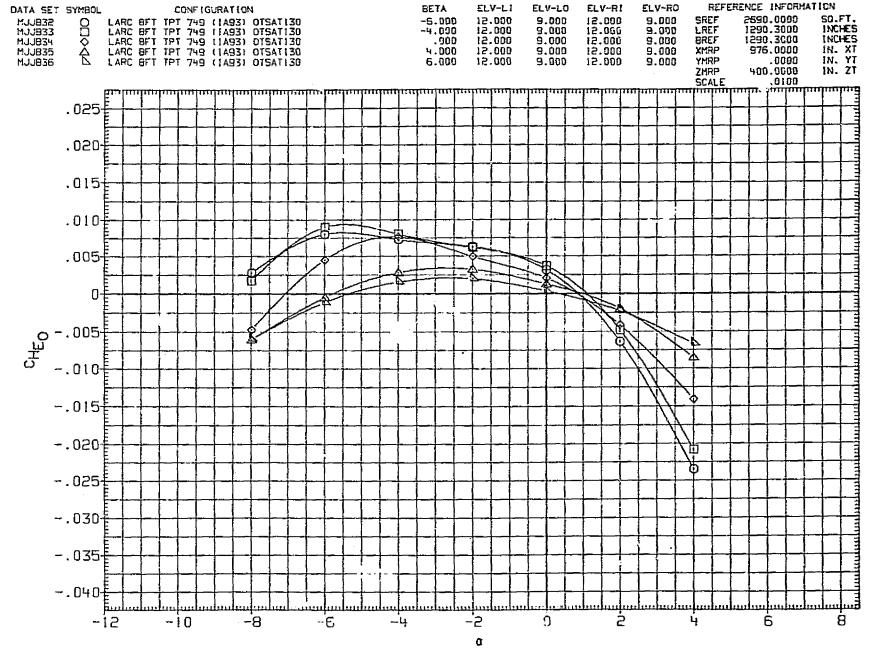


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = .90

PAGE

470

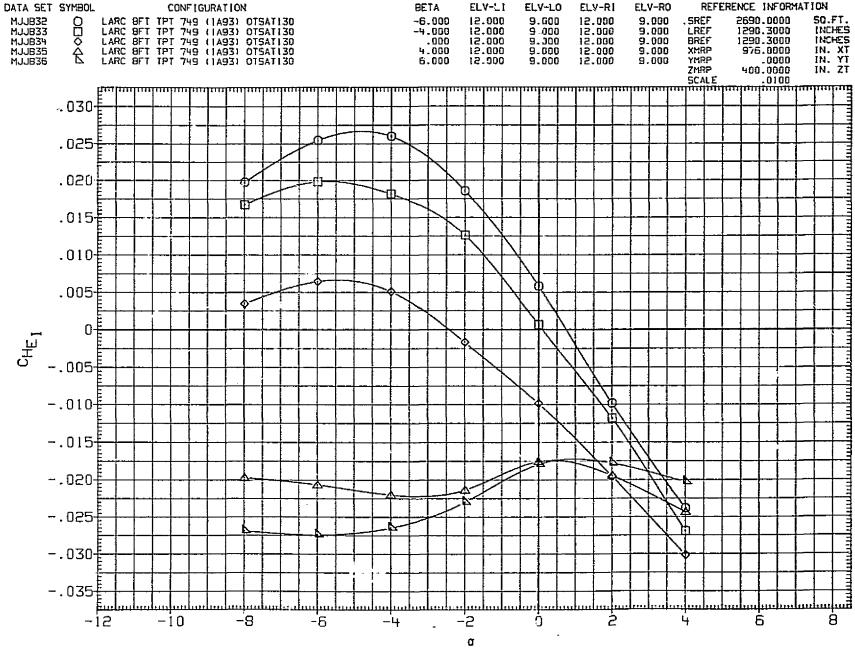
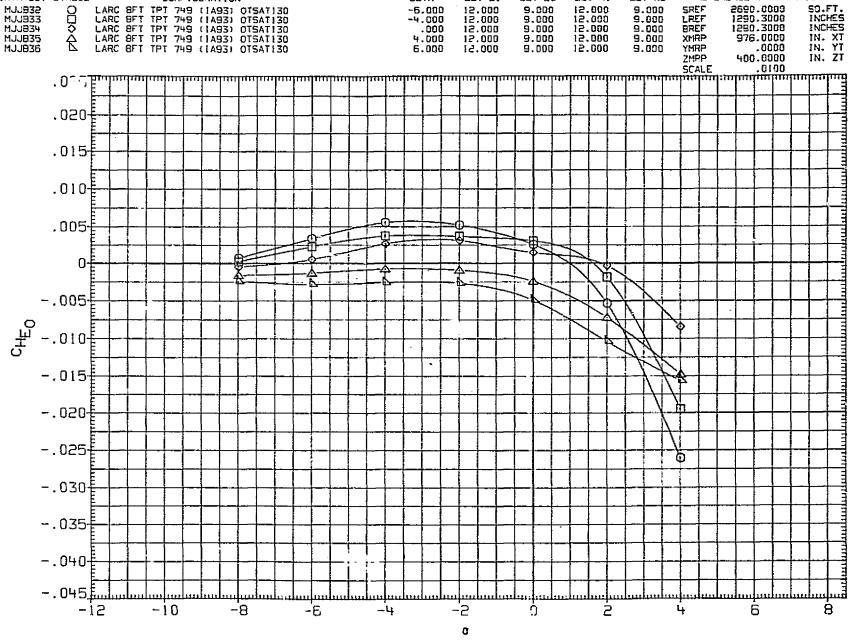


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

PAGE 47!



BETA

ELV-LI

ELV-LO

ELV-RI

ELV-RO

FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B)MACH = .98

DATA SET SYMBOL

CONFIGURATION

PAGE 472

REFERENCE INFORMATION

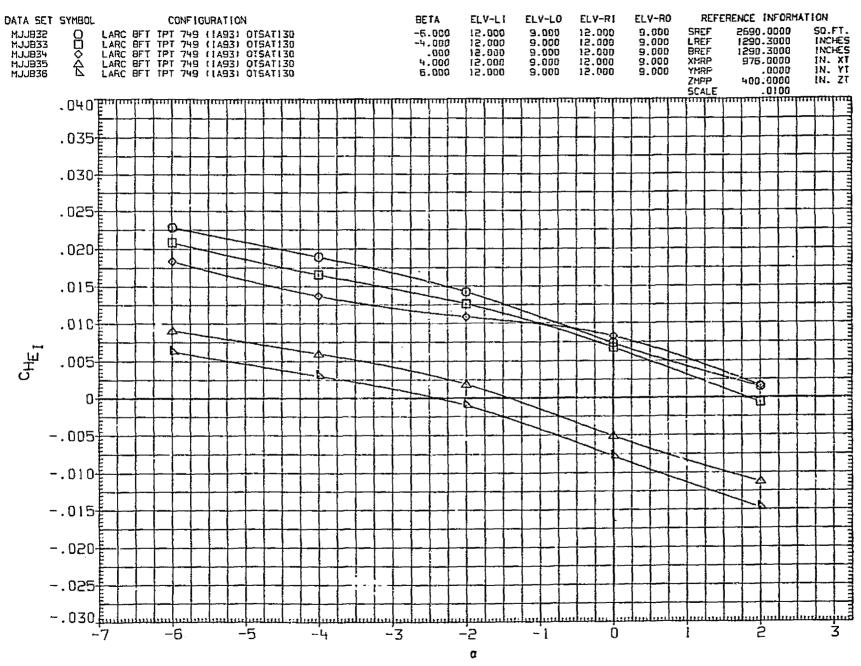


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

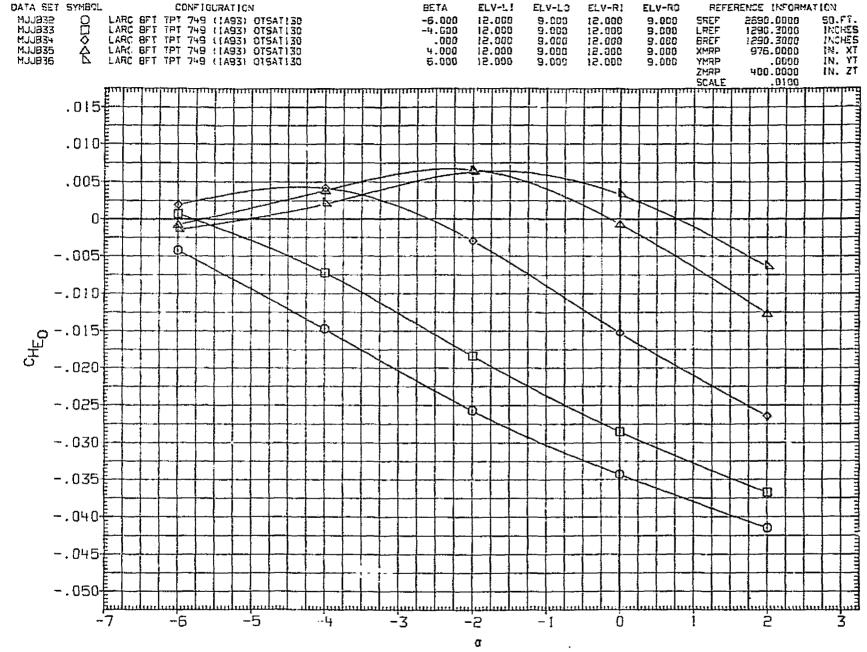


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

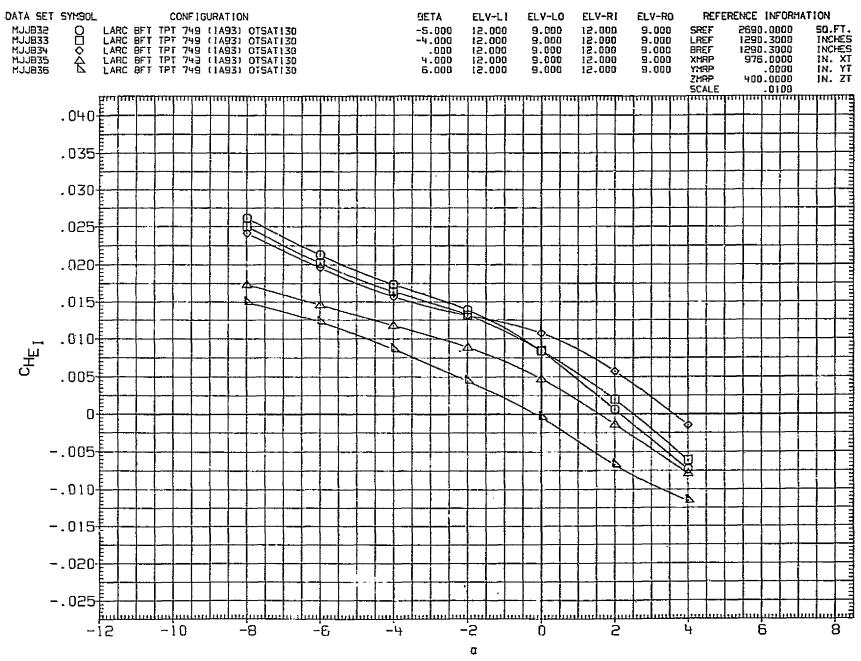


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(D) MACH = 1.20 PAGE 475

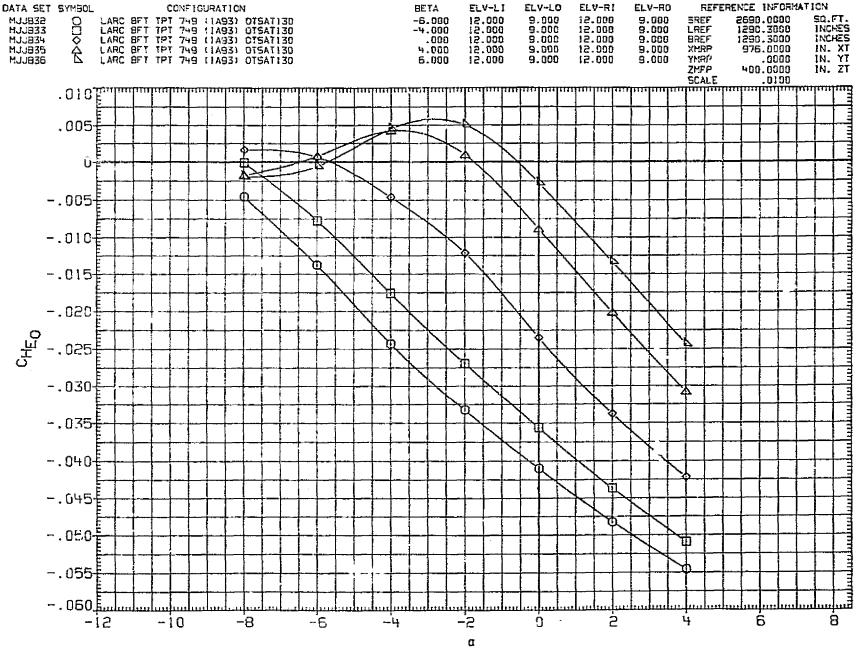


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(D) MACH = 1.20 PAGE 476



FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = .90 PAGE 477

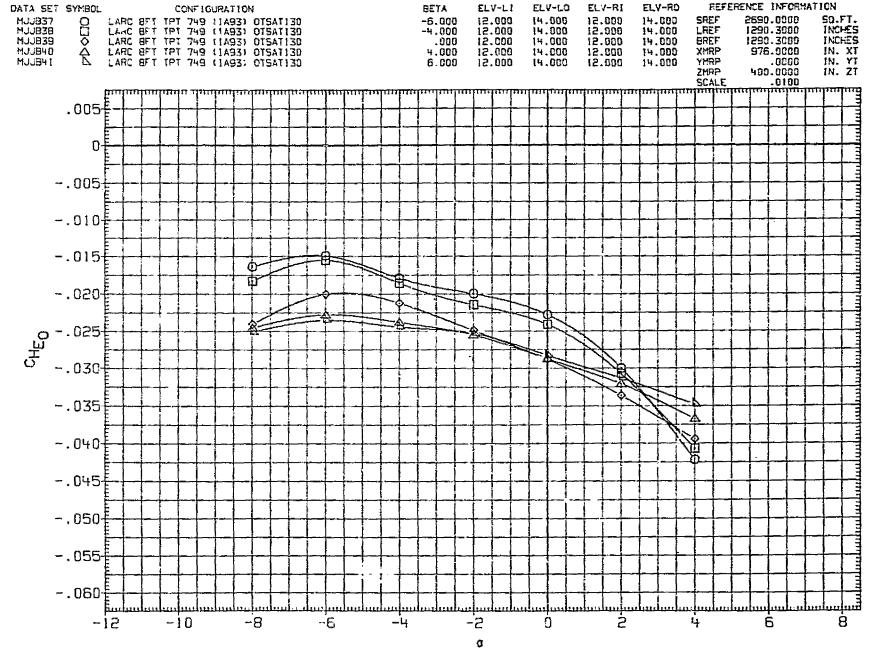


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = .90 PAGE

478

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

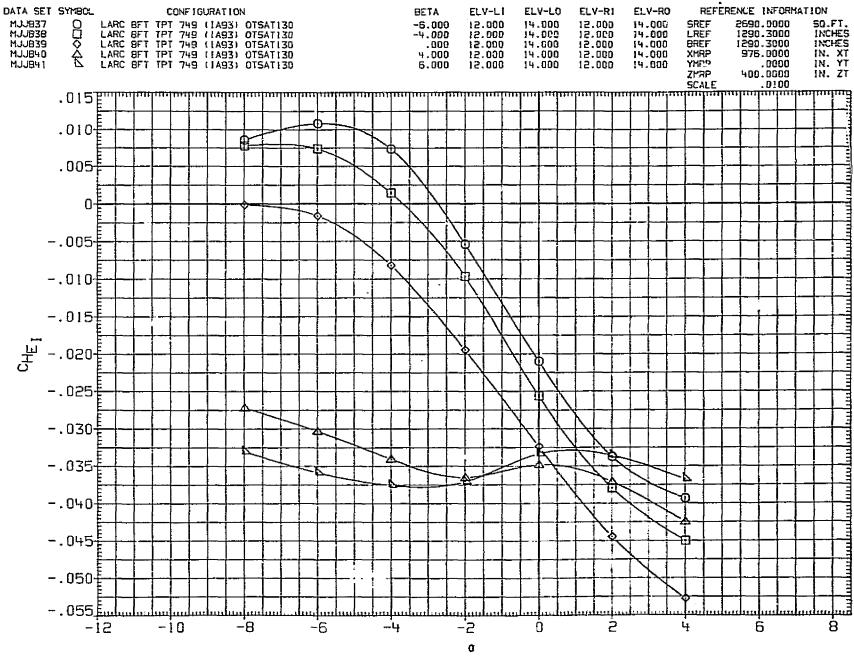


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B) MACH = .98PAGE 479

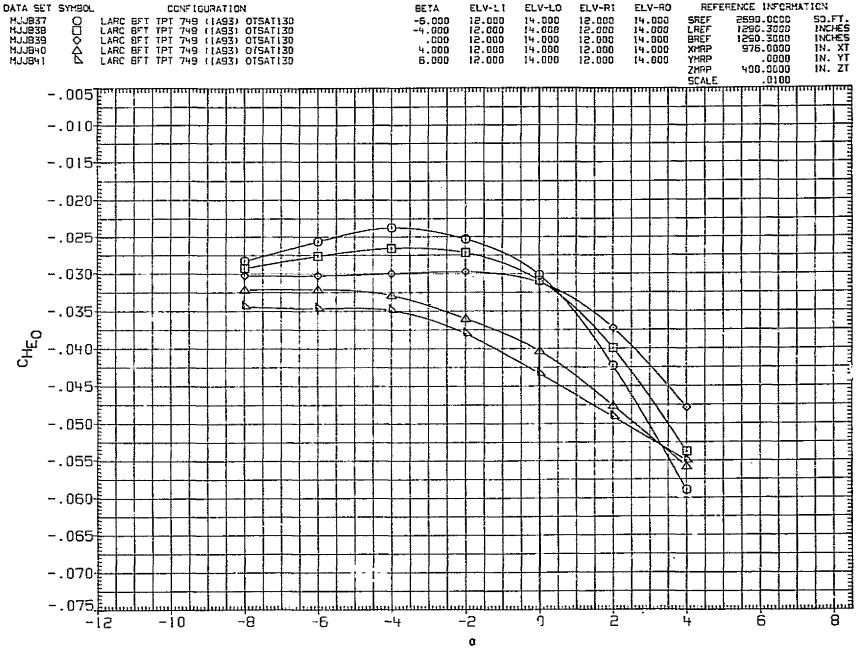


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

PAGE +80

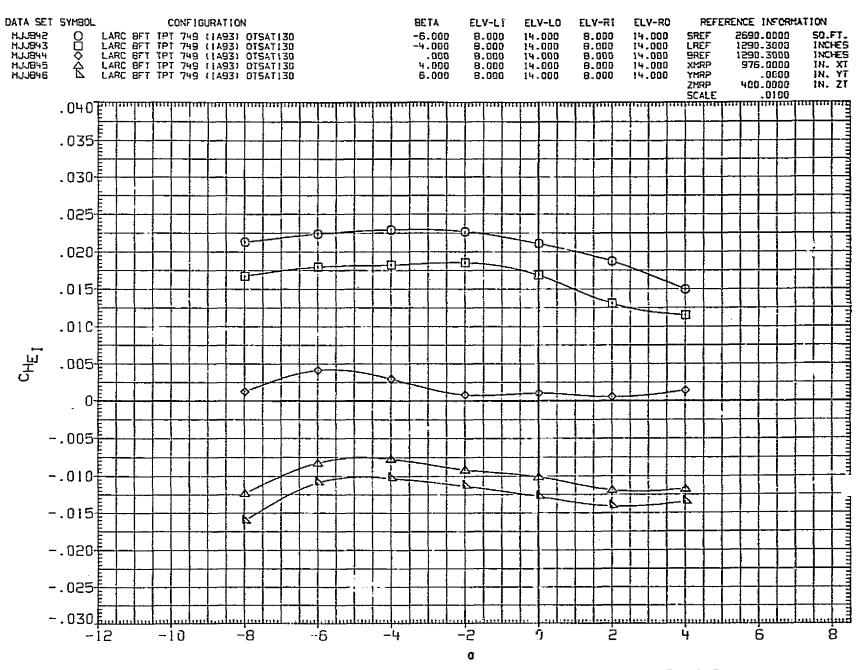


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

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(A) MACH = .90

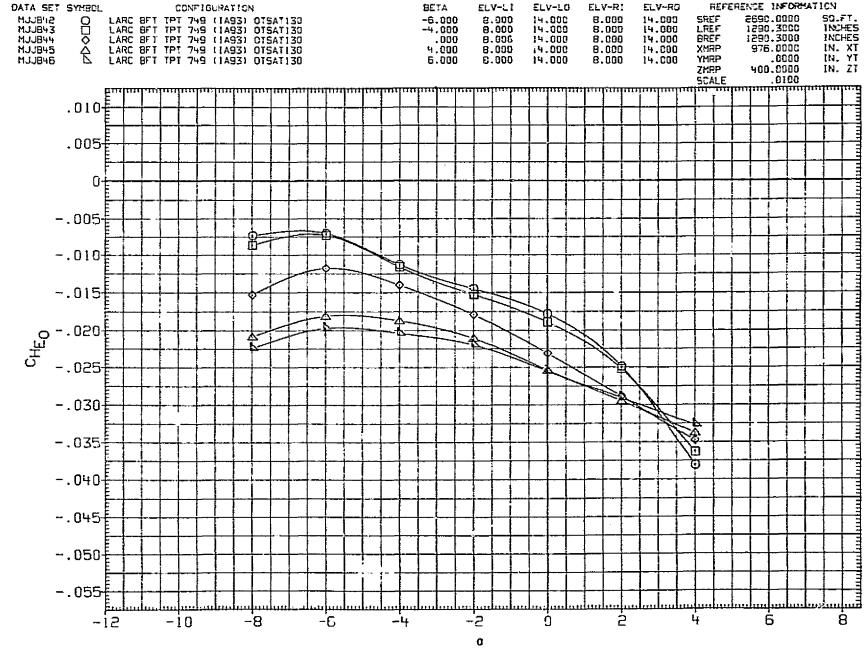


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

PAGE

482

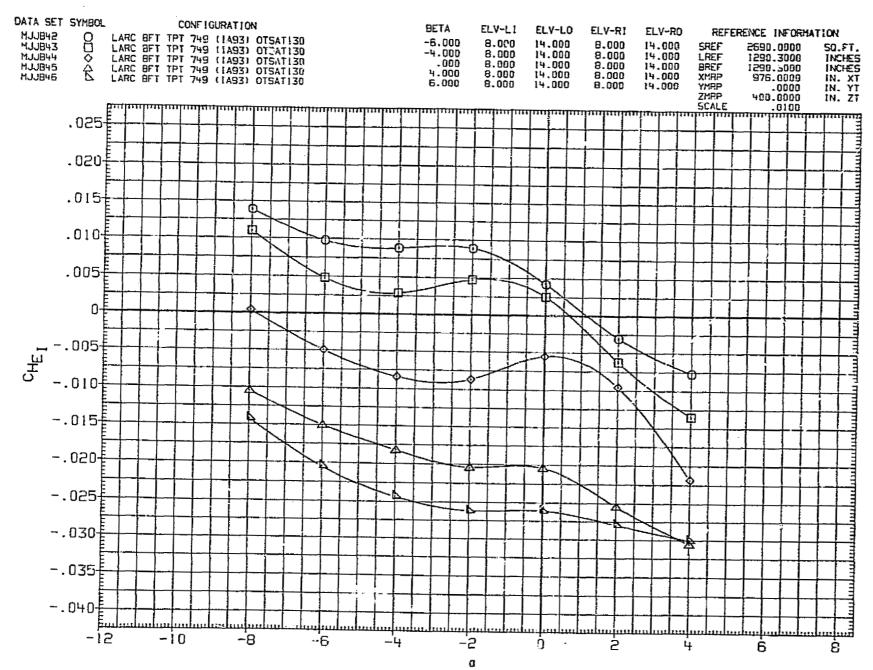


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B)MACH = .98

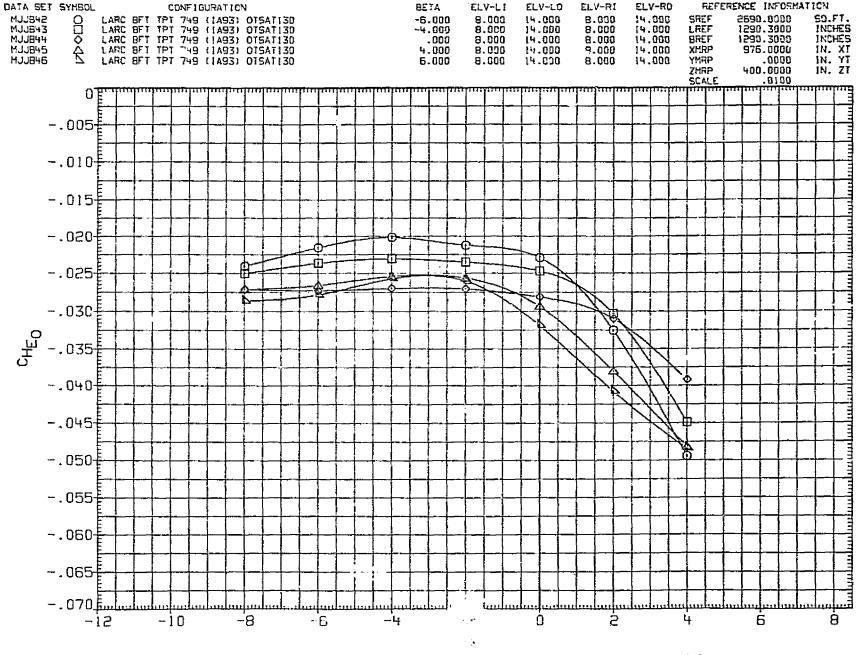


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B) MACH = .98 PAGE

484

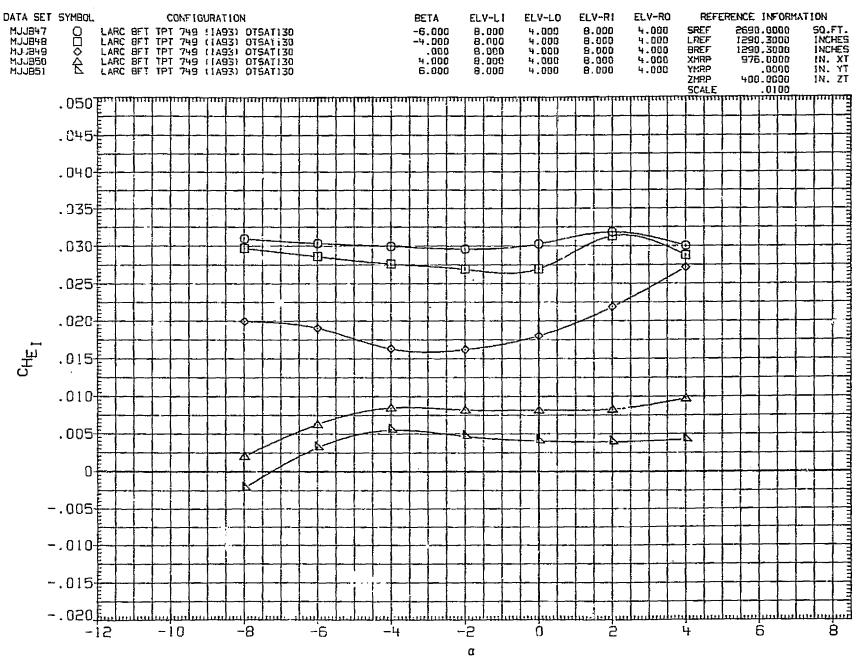


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

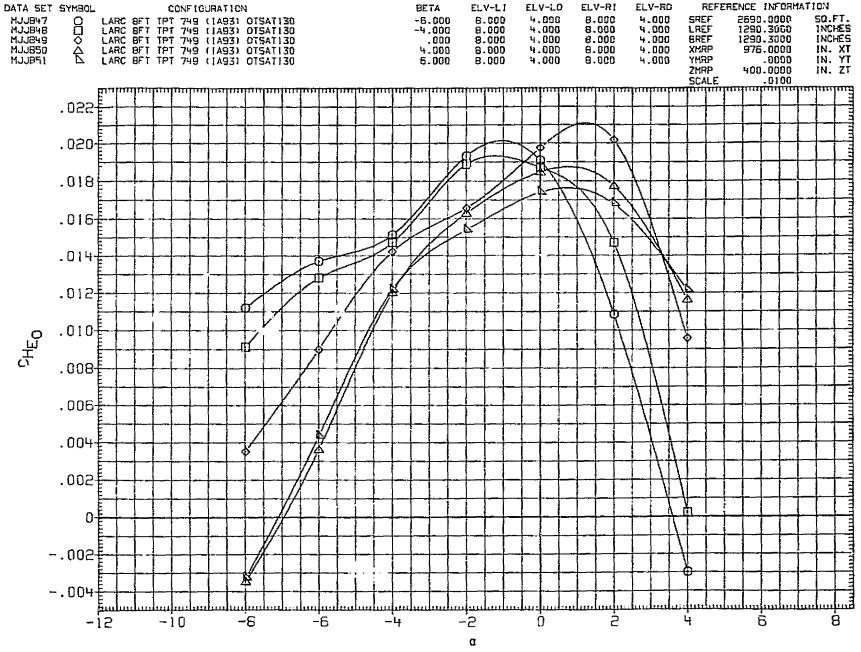


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A)MACH = .90 PAGE 486

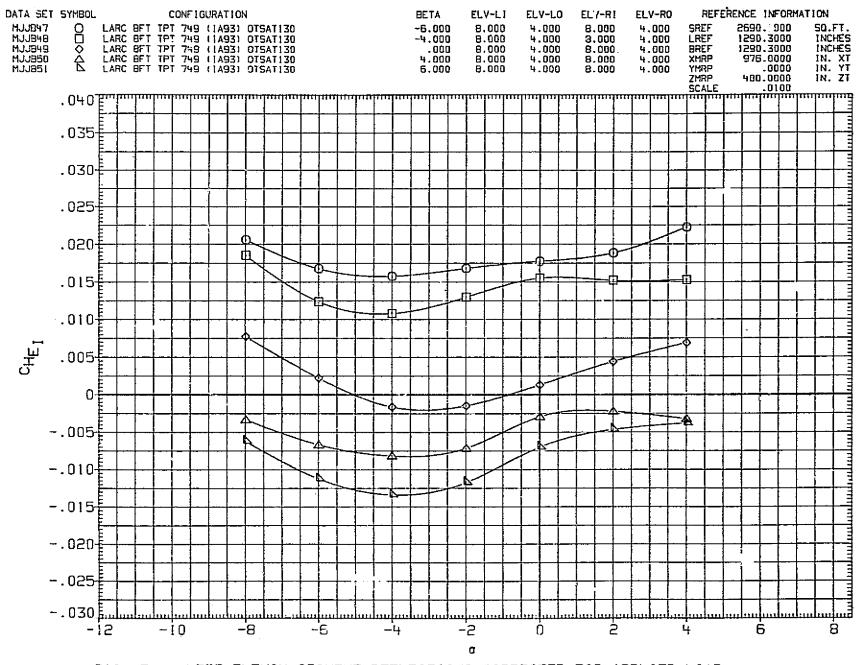


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

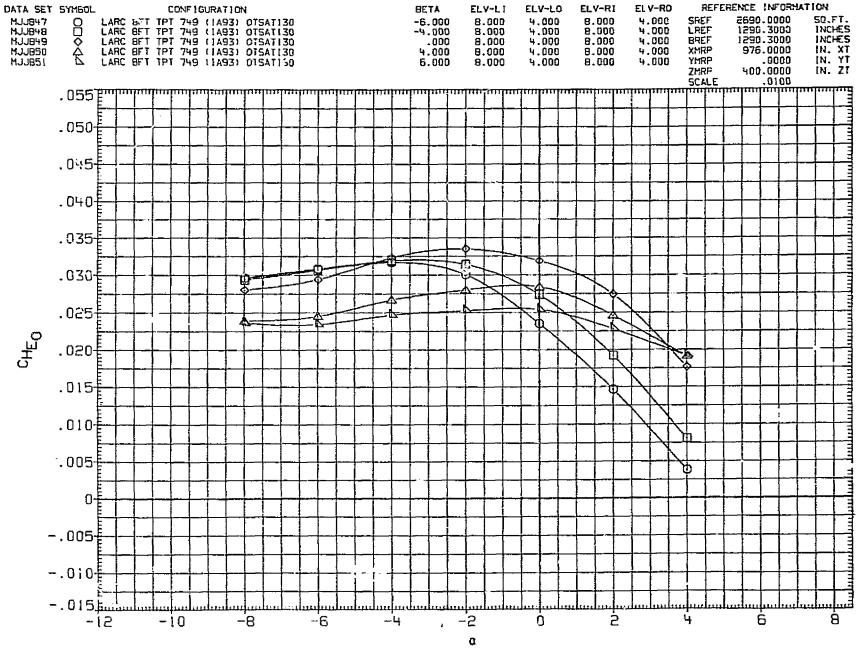


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B)MACH = .98

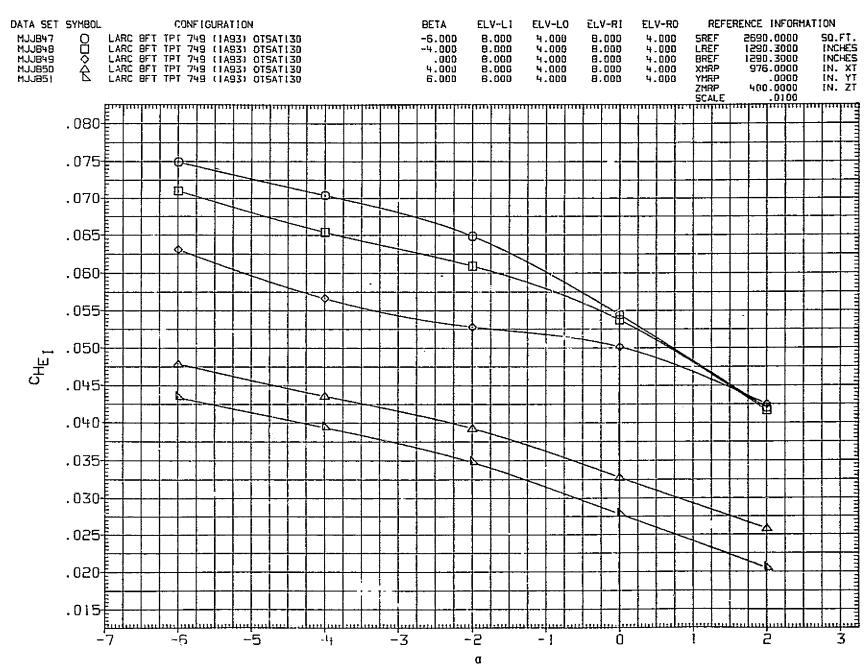


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

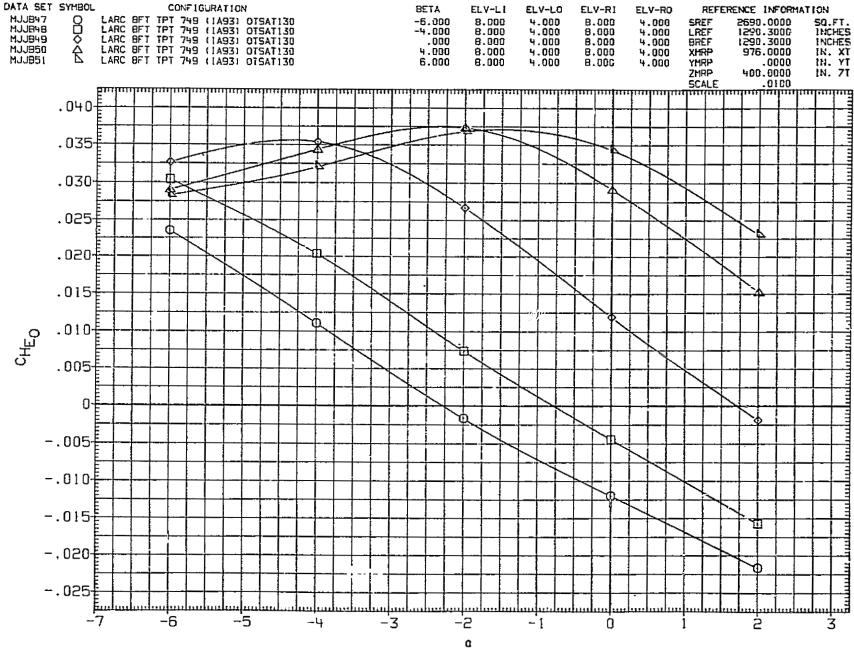


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

 $\{C\}MACH = 1.15$

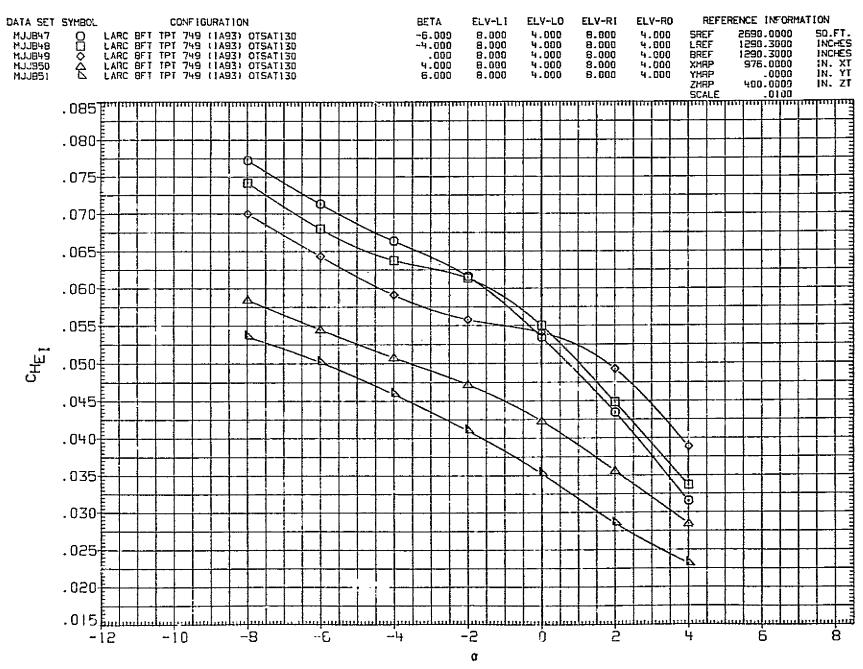


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

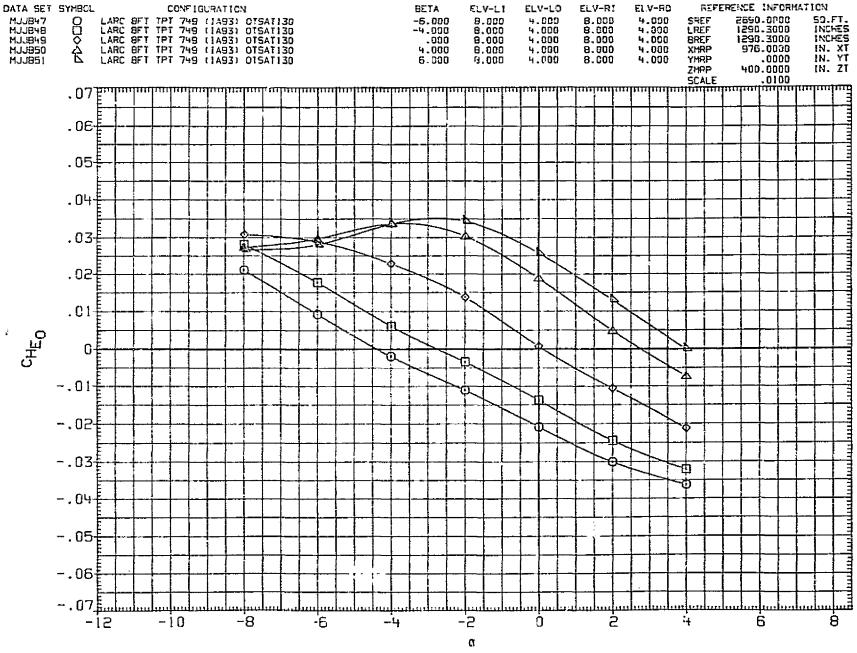


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(D)MACH = 1.20

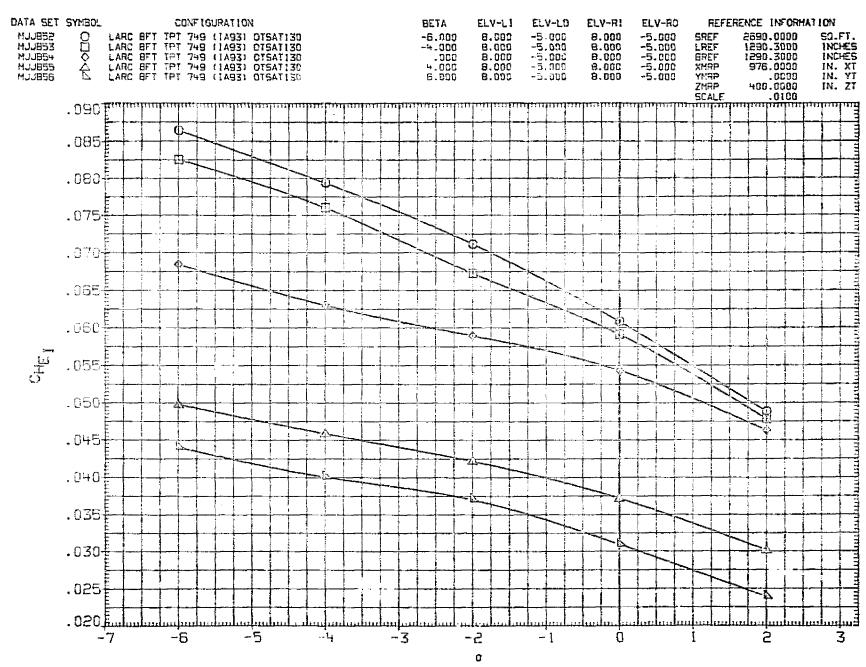


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = 1.15 PAGE 493

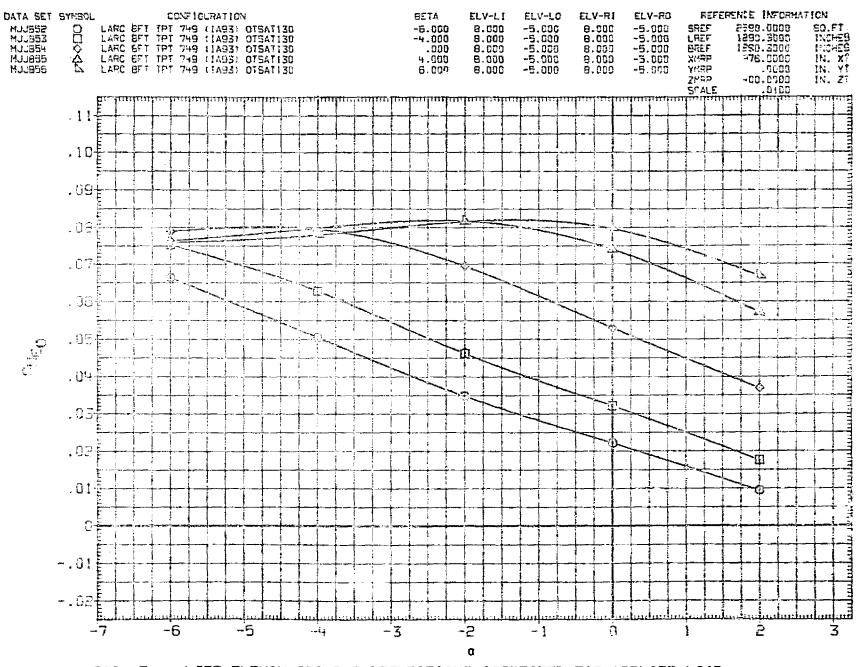


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A) MACH = 1.15 PAGE 494

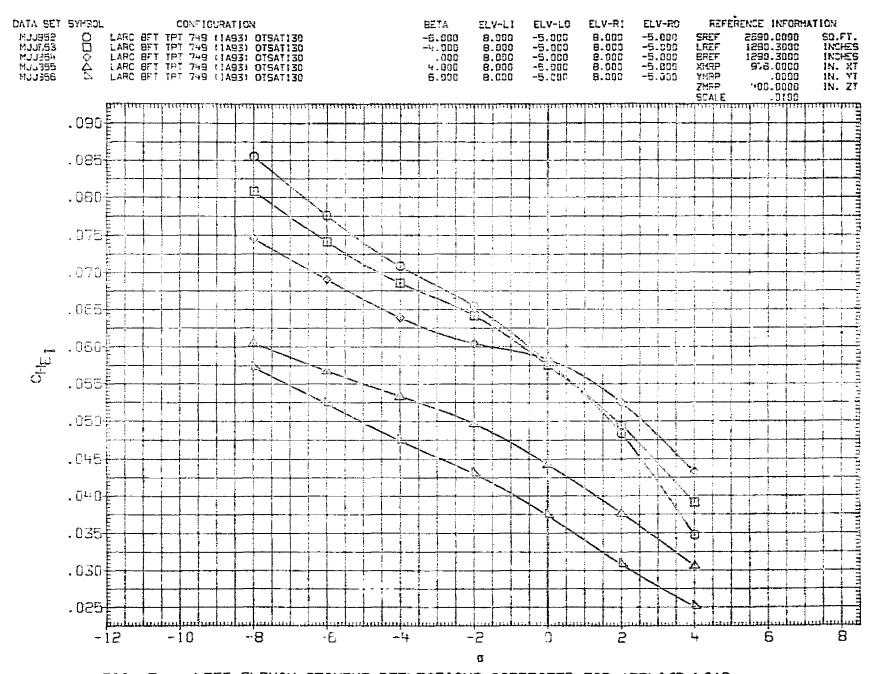


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

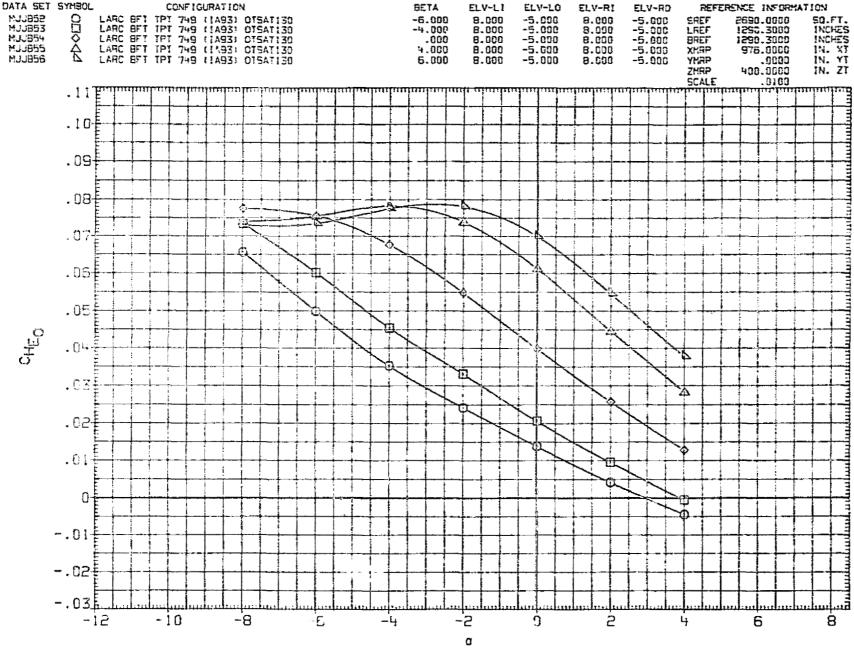


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

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496

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

(B)MACH = 1.20

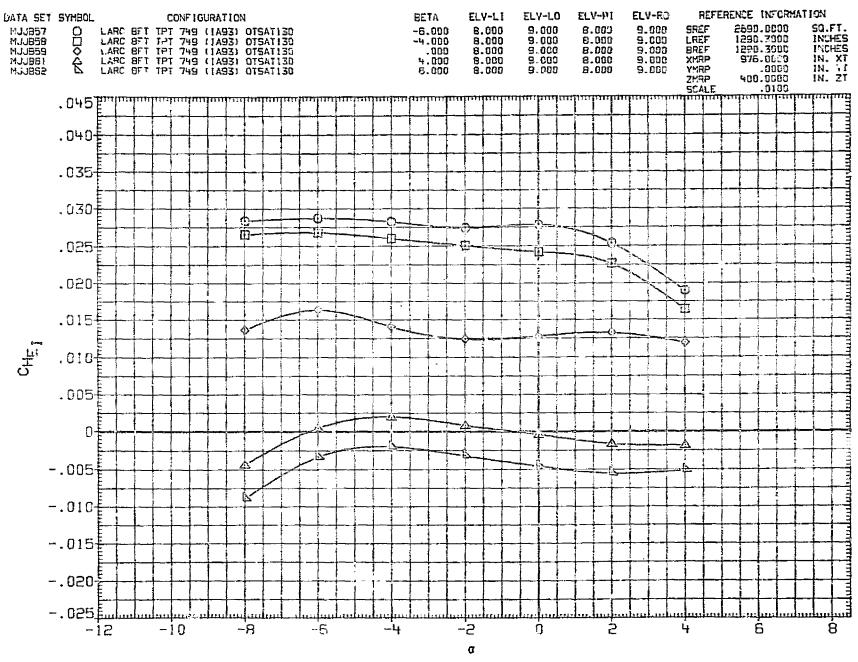


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

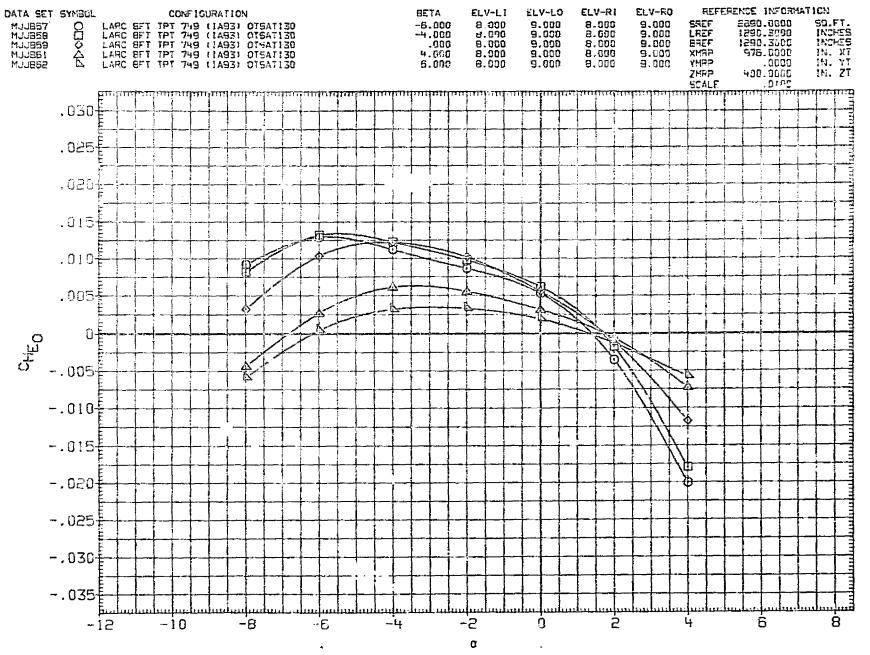


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(A)MACH = .90

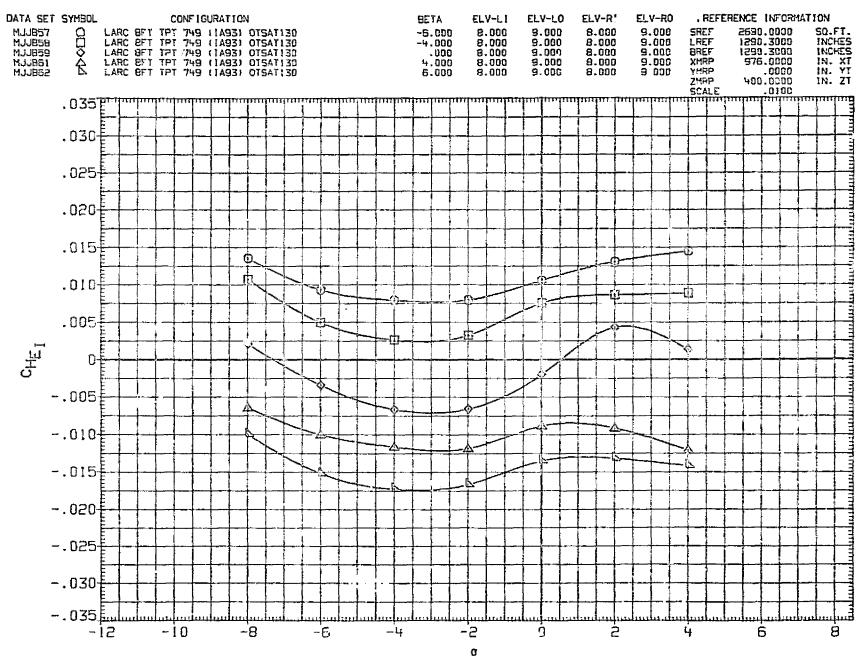


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B) MACH = .98 PAGE 499



BETA

DATA SET SYMBOL

CONFIGURATION

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ELV-L1

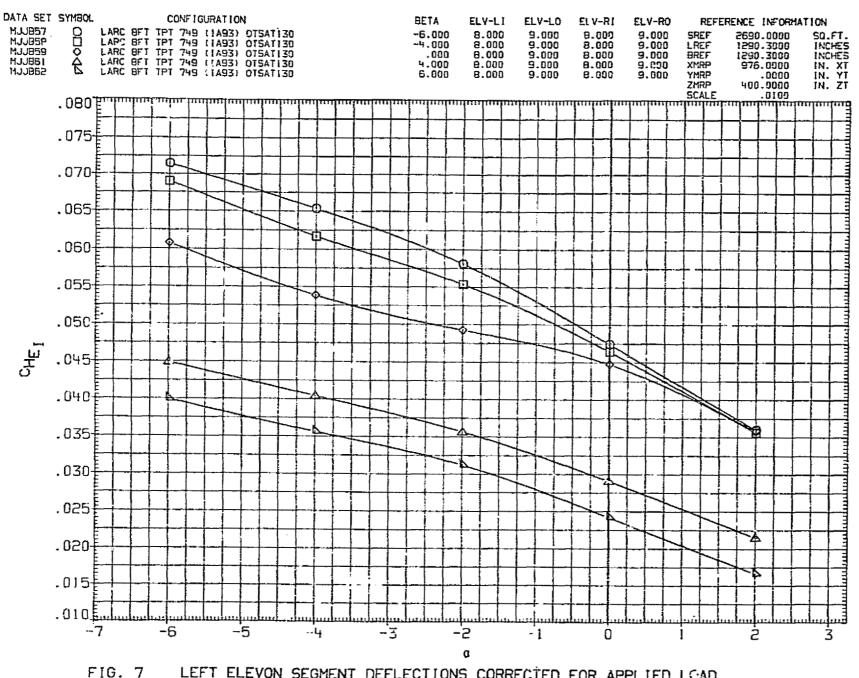
ELV-RI

ELV-RO

REFERENCE INFORMATION

FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(B) MACH = .98 PAGE 500



LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(C)MACH = 1.15

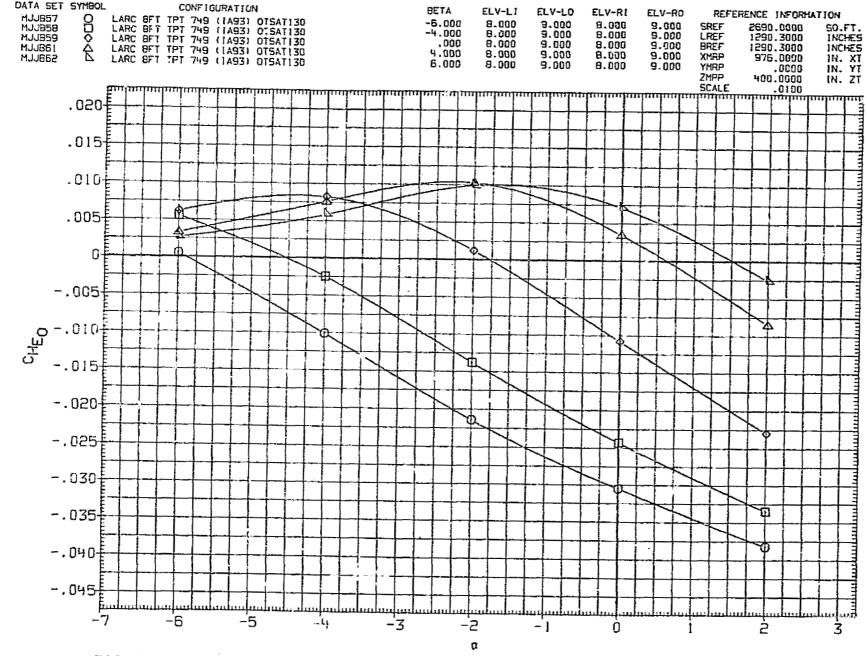


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(C)MACH = 1.15

PAGE 502

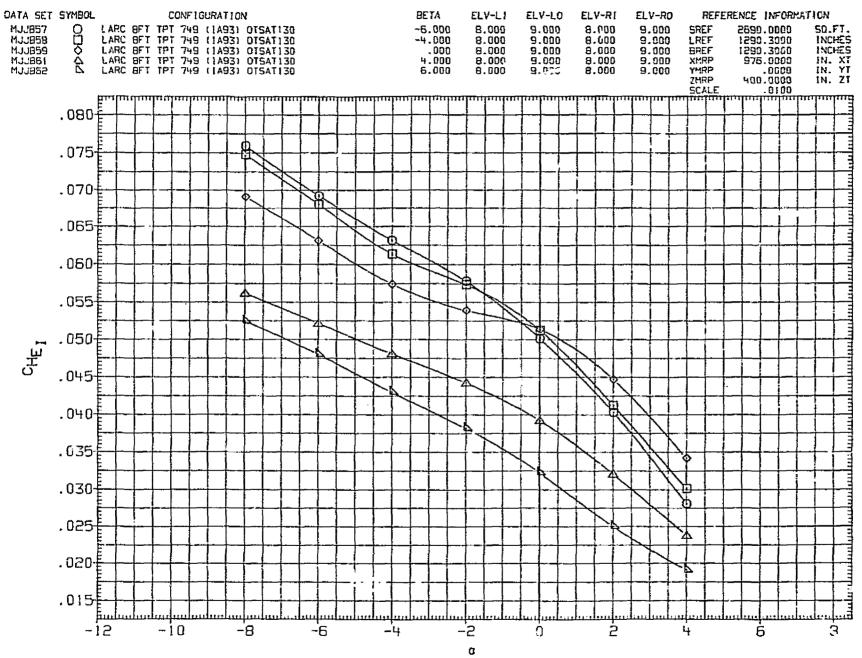


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(D) MACH = 1.20

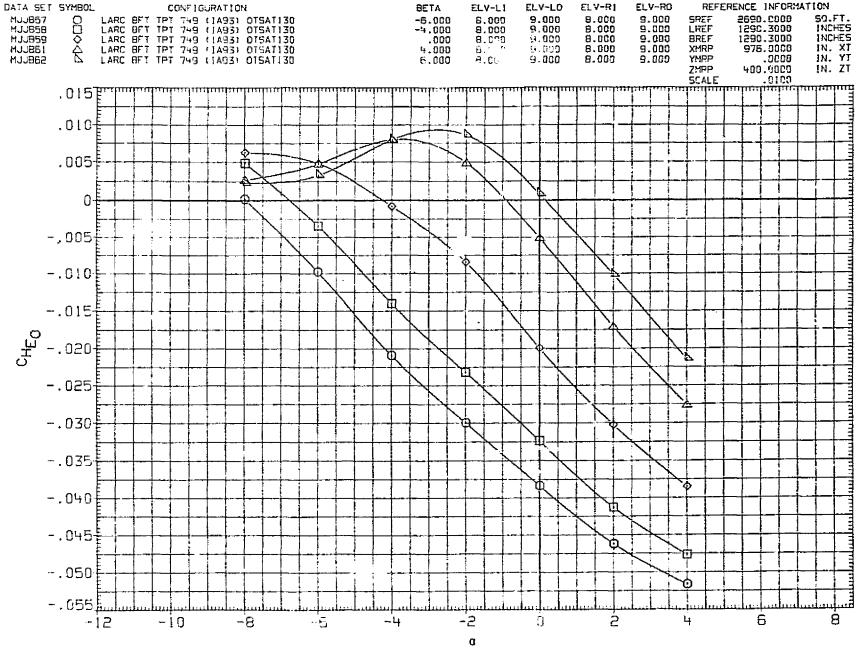


FIG. 7 LEFT ELEVON SEGMENT DEFLECTIONS CORRECTED FOR APPLIED LOAD

(D)MACH = 1.20 PAGE 504